

Leveraging Education Technology to Reach Disadvantaged Children and Youth

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Acronyms

ALT	Adaptive Learning Technologies
CEOSS	Coptic Evangelical Organization for Social Services
EDC	Education Development Center
EDGE	English and Digital for Girls Education
EdTech	Education Technology
F2F	Face to Face
ICT	Information and Communication Technology
INGO	International Non-Governmental Organization
IRI	Interactive Radio Instruction
IVR	Interactive Voice Response
LMR	Learning Management System
MHM	Menstrual Hygiene Management
mLearning	Mobile Learning
MOOC	Massive Open Online Courses
NGO	Non-Governmental Organization
OER	Open Educational Resources
SDL	Self-Directed Learning
SRL	Self-Regulated Learning
SMS	Short Messaging Services
T4D	Technology for Development
T4L	Technology for Learning
UIS	UNESCO Institute for Statistics
UNESCO	United Nations Educational, Scientific, and Cultural Organization
UNICEF	United Nations Children’s Fund

WASH	Water, Sanitation and Hygiene
WHO	World Health Organization

Chapter 1 | Context and Scoping

1.1. Purpose and report outline

Education technology (EdTech) is a relatively new programming opportunity for UNICEF Country and Field Offices, partners and stakeholders. EdTech is not a new field of course, with many governments, civil society, and private sector partners already investing heavily.

EdTech can encompass a wide range of technologies used for education, but in this report, the term specifically refers to **learning technologies**¹, i.e. any learning or training solutions provided through Information and Communication Technology (ICT); this includes computers/laptops, tablets, smart and feature phones, eReaders, radio and television.

The purpose of this report is to identify areas of opportunity for engaging with learning technologies and adding value, in particular for UNICEF and partners. Specifically, the report will support UNICEF at regional and country levels in considering how EdTech could complement or strengthen existing education programming. Since the school closures during COVID-19, a wide range of education technologies have been rolled out in countries, though they often do not reach the most disadvantaged. A large proportion of children and youth in rural areas, and from the poorest wealth quintile, do not have access to radio, TV or Internet. It is important therefore to consider the constraints and opportunities specifically for reaching disadvantaged children and youth.

The purpose of the report is as follows:

- To guide UNICEF country offices, partners and stakeholders with the scoping, review and implementation of education technology solutions with a focus on reaching disadvantaged children and youth;
- To provide relevant, notable examples of education technology solutions already being implemented in South Asia and globally;
- To discuss emerging trends, recommendations, and best practices for the use of education technology in contexts of interest, considering the specific barriers and opportunities for disadvantaged children and youth.

Chapter 1 provides guidance on the process of considering the relevance of technology in addressing specific challenges in the Education sector, and subsequently, determining the key components for an effective solution; for this purpose, two checklists were developed with guidance corresponding to specific parts of the checklist provided in subsequent Chapters.

Chapter 2 outlines the how and the what of types of technology solutions are being used, including the advantages and disadvantages of these solutions for reaching disadvantaged populations, as well as examples of solutions relevant to low- and middle-income country contexts.

¹ Also referred to as T4L or Technology for Learning

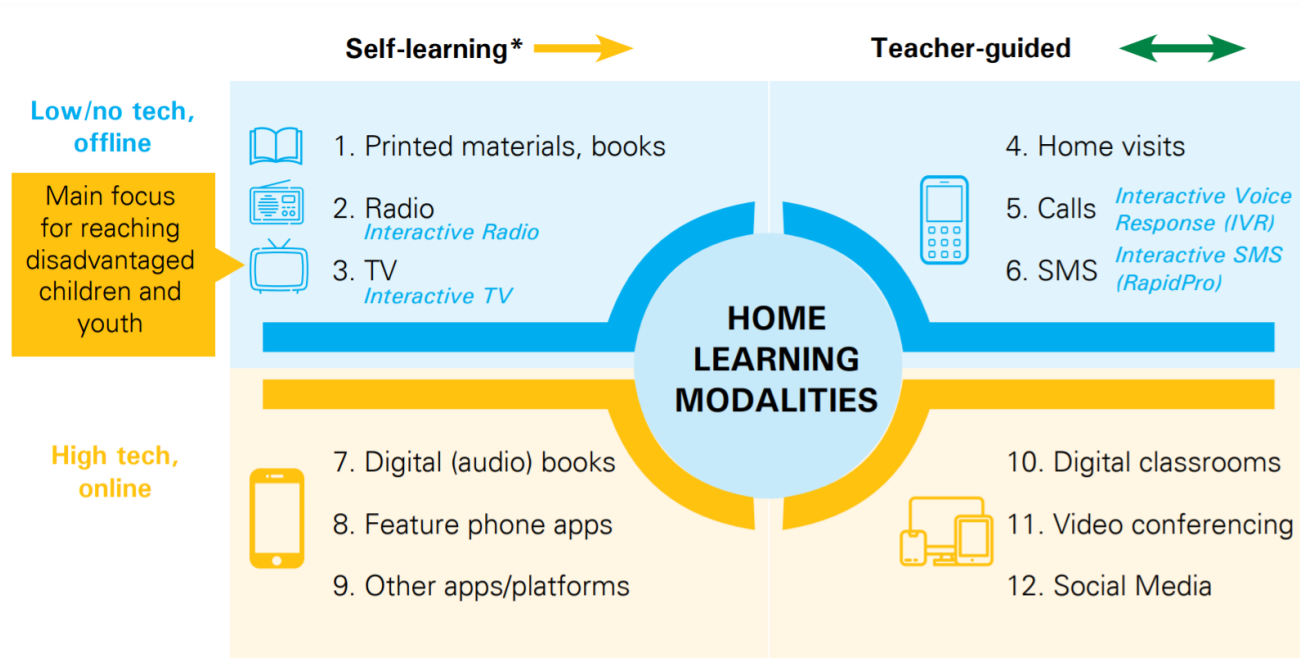
Chapter 3 discusses UNICEF’s role in leveraging EdTech and presents recommendations and guidance specific to UNICEF Regional and Country Offices.

Chapter 4 provides recommendations and best practices for planning, designing, and developing technology solutions for learning, and outlines potential next steps and strategic directions for future work in leveraging technology solutions for the Education sector.

1.2 Overview of Key Learning Modalities for Home Learning

The matrix below outlines 12 key learning modalities for out-of-school children and youth, including children not in school due to temporary school closures due to pandemics such as COVID-19, natural disasters, or conflict. The bottom half reflects high tech solutions like online platforms and apps. The top half reflect low tech solutions like radio, TV and SMS. There is also another division, left and right. On the left side you have self-learning modalities, which are not ideal for younger children and children from disadvantaged households with less parental support. On the right side you have the teacher facilitated modalities. Continued teacher interaction, guidance and feedback is very important for the continuity of learning as well as to instill a sense of normalcy. These approaches are not mutually exclusive, and combinations can in fact be more effective – in particular, combining self-learning (e.g. through TV) with teacher guided modalities (e.g. through SMS and calls). Some platforms like virtual classrooms allow for both self-learning and teacher-guided approaches within the same platform. The different learning modalities are described in more detail in the ROSA .

Learning Modalities Matrix: Low/no Tech, High Tech, Self-learning and Teacher guided



* Ideally supported by parents/caregivers

1.3 Specific use cases for technology for learning

Technology is beginning to play a large role in education in every country across the world, and UNICEF is in the process of defining where it should play a larger role as an agency. Flagship reports such as the World Development Report 2016 and 2018, and UNICEF's State of the World's Children Report 2017 have brought more global attention to this area recently, helping to identify many areas of the Education sector where technology could help to accelerate learning outcomes, including:

- Administration
- Assessment
- Delivery of educational content in- and out-of-the-classroom
- Digital skills
- Monitoring and evaluation of the sector
- Pedagogy and learning practice

The UNICEF Education teams in UNICEF HQ, West and Central Africa Region, and Eastern and South Africa Region have been involved in efforts to identify opportunities for increased investment by UNICEF in EdTech in their respective regions. Rather than take a broad perspective of the Education sector, the Regional Office for South Asia presents this report for two particular areas of interest - **teacher training** and **reaching out-of-school children and youth, or children and youth at home due to school closures**.

Given these areas of interest for the report, below are five specific use case scenarios developed for understanding the scope of technology for learning solutions within the region. These use cases or 'scenarios' focus the research on key education challenges faced in the region of South Asia, for which traditional approaches do not produce the desired outcomes or are not cost-effective. There is, therefore, a need for alternative, innovative approaches where technology could play a key role.

The first scenario relates to teacher training in informal settings. The other four scenarios relate to different types of out-of-school children and youth groups: adolescent girls, children and youth who have never been enrolled in school, have been out of the education system for several years or temporarily out of school, migrating or displaced children and youth, and children and youth with disabilities.

First Scenario: Teacher training

There is a need for teachers and facilitators for informal educational settings that serve vulnerable children and youth, such as in the refugee camps in Cox's Bazar, Bangladesh, and rural areas in Afghanistan and Pakistan where community schooling is more prevalent. In such contexts, education technology could be leveraged to improve teacher training, to enable applicants who lack experience and qualifications to become better teachers and facilitators (including through self-study). It could focus not just on pedagogy, but also on improving teachers' subject knowledge.

Second Scenario: Adolescent girls

When looking at the situation of out-of-school youth, adolescent girls often have more limited opportunities than boys to continue their education for various reasons, including early marriage, mobility restrictions, safety risks and sexual harassment, lack of WASH (Water, Sanitation and Hygiene) and Menstrual Hygiene Management (MHM) facilities in schools, and other, socio-cultural barriers to (continued) education. Mainstream approaches to education often fail to address the obstacles faced by adolescent girls.

Can the use of mobile phones with internet access provide alternative opportunities for adolescent girls to benefit from online education resources in their homes or through community-based education? While there is currently a large gender gap in South Asia in access to mobile technologies, the situation is changing rapidly. In 2018 alone, Afghanistan experienced an increase of 142% in the number of internet users, which translates to 9.7 million people now regularly using the internet on a monthly basis.² At least 16% of this huge increase are female according to Facebook's statistics. As similar trends occur across South Asia, how/should UNICEF prepare to utilize these new opportunities to benefit adolescent girls?

Third Scenario: Out-of-school children and youth and during school closures

During school closures due to pandemics or natural disasters, large numbers of children and youth may be out of school. COVID-19 caused all children and youth to be out of school across South Asia. But even when schools re-open, millions remain out of school, in particular in Afghanistan, Bangladesh, India and Pakistan. Many have either never been enrolled in school or have been out of the education system for several years, making it difficult to integrate them into mainstream education. Additionally, a large number may also be contributing financially to their families and therefore cannot attend school during regular school hours. For out-of-school children and youth, regardless of the cause, solutions are needed which are scalable, flexible and multi-pronged to reach as many children as possible.

Fourth Scenario: Migrating and displaced children and youth

Large numbers of children and youth are excluded from education every year due to seasonal migration, forced displacement or nomadic lifestyles. Such situations often call for flexible and even portable education solutions which can be rapidly deployed. There are no reliable figures, but it is estimated that millions of children and youth in South Asia are out of school due to seasonal migration alone. This excludes the many out of school children and youth who are displaced due to conflict, such as the Rohingya in Bangladesh, or natural disasters, or out of school due to nomadic lifestyles such as many of the Kuchi nomadic communities in Afghanistan.

Fifth Scenario: Children with disabilities

² We are social - Afghanistan - Digital Report 2019.
<https://datareportal.com/reports/digital-2019-afghanistan?rq=afghanistan>

Children with disabilities are disproportionately out of school. It is estimated that around 5.3% of children age 0 to 14 in South and East Asia have a moderate or severe disability, increasing to 14.8% for the 15 to 59 years old age group (WHO). Children with disabilities are extremely vulnerable to discrimination and being deprived of basic human rights, including the right to education. It is estimated that over half of children living with a disability in a developing country do not attend school. In South Asia, children with disabilities face extreme discrimination in school and are often unable to attend formal schooling due to a lack of accessible infrastructure and materials, unaccommodating curriculum, and unqualified teachers for accommodating various needs in an inclusive educational environment. They are also often ‘invisible’, hidden in homes due to stigma.

1.4 Checklists

During interviews with UNICEF Country Office colleagues, two distinct situations were commonly described. One situation was an open-ended question regarding a specific education challenge, such as when a government partner approaches UNICEF and asks, for example: “We need to increase the number of teachers being trained; how can technology help?”. The second situation is specific to a proposed technology or learning platform, such as when a government partner or private sector company approaches UNICEF with a technology solution. How do we know if it is relevant and useful, and if yes, how can we pilot or implement it?

This report presents two checklists which act as guides to addressing such questions. It is recommended that the UNICEF Technology for Development (T4D) focal point in the country or regional office is engaged to support and guide this process, and where relevant, HQ and regional education/innovation colleagues.

1.4.1 Context and Scoping

Regardless if one is searching to identify readily available solutions, looking to develop a solution, or judging a prospective technology proposed by a provider, it is important that **the checklist is approached without a specific technology solution in mind**. By approaching the checklist in this manner, information will surface in terms of what is necessary for addressing the need. As a result, there will be a greater understanding of the criteria and what is an ideal and best-fit solution.

This first checklist helps define the challenge and context for which a technology solution is being considered. Its purpose is to guide the consideration of whether or not a technology solution may be relevant and useful. It is important to have a clearly documented reasoning for using technology, and to avoid falling prey to the ideology that technology is a silver bullet for solving any kind of educational challenge.

Checklist A: Context and Scoping

- ❑ **1. Problem statement:** Describe the issue, challenge, or bottleneck that needs to be addressed to achieve the desired impact. E.g. “In areas of the country where there is a

shortage of trained teachers with appropriate qualifications, there is a need to significantly improve teacher subject knowledge and pedagogical training to address these shortcomings.”

- ❑ **2. Background:** (1) Describe why the project is being initiated and where it originated (e.g. Country Office, Programme, or Partner feedback). (2) How does your organization currently respond to this need (if applicable), and the challenges related to the current response? (3) What are the SDG’s, UNICEF Strategic Plan Priority, Headline Results, and CPD results/activities related to the intervention? (4) What is the scope in terms of the target group (e.g. number of teachers, children), and geographic location(s)? (5) What is the budget for the intervention?
- ❑ **3. Project outcome(s):** Project outcomes are what the project expects to accomplish at the beneficiary level as a result of the Project Outputs. E.g. “All young people enrolled in public schools in grades 9-12 complete a sex education course and received credit on their academic transcript.”
- ❑ **4. Definition of success:** What does success look like? Describe this vision, including who should be operating the system when it becomes part of the normal, mainstreamed way of working. E.g. “The product will aid the education ministry in offering a comprehensive sexual education course which will ensure all young people in grades 9-12 receive accurate and important information. The content will be hosted on the Education Ministry website.”
- ❑ **5. Stakeholders:** (1) Who are target beneficiaries? (2) Who are the primary users of the potential technology solution? (2) Who are key stakeholders who need to be engaged? (3) What is known about the primary users and each of the stakeholder groups? E.g. age, gender, socioeconomic background, literacy levels, disability and special education needs (4) What ICTs do they already have access to? (5) What is their level of ICT literacy? (6) What is their language of choice for reading, writing and communicating?
- ❑ **6. Status quo and bottlenecks:** (1) Describe the current processes in this sector? (2) What are the key bottlenecks/challenges? E.g. “Currently teachers are trained in delivering the curriculum and provided materials to do so. The bottleneck is that teachers are not comfortable communicating the information, therefore, the courses are not being taught, and students are not able to receive valuable information or have their questions answered.”
- ❑ **7. Addressing bottlenecks:** (1) based on the bottlenecks/challenges, what are criteria for selecting technology solution(s)? E.g. “Based on the bottleneck, the technology solution must deliver sex education, ensure learners grasp key concepts, and it must be accessible to all students in grades 9-12.”
- ❑ **8. Use cases:** (1) What are the “uses cases” for the technology solution - scenarios of how different stakeholders will use the technology solutions? (2) How will the users interact with the technology solution? 1:1 device, 1 device per small group of users, 1 device per class, bring your own device, radio broadcast, television broadcast or other? (3) What are the possible learning environments in which the technology solution would be implemented – e.g. in schools, community centres, home, etc.?
- ❑ **9. Tangible deliverables:** (1) What type of hardware would be the most appropriate for the intervention? Feature phone, Smartphone, tablet, laptop, radio, television, storage device, eReaders or others. (2) What type of software will be the most appropriate for the intervention? SMS based content, educational Apps, personalised learning platform, e-learning courses, digital educational games or others. (3) What are potential tangible deliverables resulting from project activities? E.g. “E-courses can provide accurate information, assess learners to make sure key concepts were understood, and be accessible to

all learners online via school computer labs and smartphones. The e-course can overcome the cultural barriers of teaching sex education.”

- ❑ **10. Risks and uncertainties:** (1) Describe the key uncertainties (i.e. barriers to success), e.g. price of the final product, funding availability, digital literacy levels among stakeholders, etc. (2) What are the technological restrictions or barriers in place, due to, e.g. absence of infrastructure (e.g., no reliable electricity, limited radio coverage or mobile connectivity), or government-imposed restrictions? How can the above barriers be addressed? Are there battery life considerations to be taken into account? (3) Are the technologies appropriate for children and youth with disabilities?
- ❑ **11. Human Resources:** (1) Who are the key focal points for this project, what are their roles and responsibilities and time allocation? (2) Who would facilitate/teach/support the initiative? (3) Would it require new staff, or can it be integrated into the work planning of existing staff? For example, will the solution be used by teachers in classrooms versus use by newly hired facilitators in tech hubs for after-school activities?

1.4.2 Planning and Design

After completing Checklist A and establishing the need for the use of technology, then Checklist B - Planning and Design - can be used for selecting specific solutions and developing a well-rounded programme. By answering the questions in this checklist, country offices will have a detailed list of criteria that can be used:

- To compare different solutions and providers;
- As a set of product development requirements when working with or selecting a developer;
- Assess what is already out there against what is needed to identify specific aspects of the solution that need to be adapted;
- To plan and design a programme by developing strategies that address key factors.

Checklist B - Planning and Design

- ❑ Perceptions of using technology in education:
 - What are the perceptions of ICT use for education amongst the primary users and stakeholders?
 - What is the buy-in level from primary users and stakeholders? Are there barriers to adoption due to perceptions? How can associated barriers be overcome?
 - What are country and/or community-specific cultural outlooks and practices in education and about the use of ICT? Are technology solutions seen as being disruptive to the social and cultural norms? How can associated barriers be overcome?
- ❑ Existing technology solutions & potential partners:
 - Within UNICEF, are there other sections/country offices currently seeking a similar solution?
 - Is there a solution that needs to be adapted/contextualised? Does a new technology tool need to be developed?
 - What are the existing T4D or technology interventions in education that have targeted the same group, or were carried out in the same geographic location(s)? Find out more

about these interventions and their scope, implementing organizations, cost, any problems encountered, strengths and weaknesses, (preliminary) results, etc.

❑ **Learning:** please note these questions apply to both out-of-school youth and teacher training

- What are the appropriate modalities for learning for this project? Face-to-Face (F2F), Remotely, Asynchronously, or Synchronously?
- What are the appropriate modes of learning for this project? Personalised learning, blended learning, mobile learning, distance learning, or self-directed learning?
- Is there an existing curriculum to which the content for the solution should be aligned?
- How is the content localised, and contextualised? For educational content that provides examples to explain a concept, these examples need to be localised and contextualised as well.
- Apart from providing access, how does the technology solution engage learners actively? Does the learner just click through different screens or are they being asked to interact with the content? For example, educational games actively engage learners.
- Does the technology solution assess the learner's level of understanding or content mastery and accordingly present material that is appropriate?
- How does the technology solution support users to learn from their mistakes?
- How would this solution be integrated into or complement existing learning activities?
- Does the solution provide summative and formative assessments?
- Does the solution support or replace a teacher/facilitator/mentor?
- What is the pedagogical framework for the technology solution? Is it research-based?
- Is there data supporting the efficacy of the technology solution for learning/training?
- Is the technology appropriate and adaptable for learners with disabilities / special education needs?

❑ **Training:** (1) How will training be provided for the use of the technology solution to the facilitators as well as the primary users? – training for facilitators is especially important for cases where the intervention involves teachers and adult mediation. Below are the types of training that need to be provided. If a technology solution has been selected, the provider needs to ensure such training opportunities are available:

- Before implementing the solution to bridge knowledge gaps;
- On an ongoing basis;
- On-demand to accommodate users;
- In an easily accessible manner to primary users and stakeholders;
- Contextualised for the primary users and stakeholders;
- In relevant languages and mediums of communication (such as audio or video).

❑ **Pro-Equity:** (1) What are equity-related issues that need to be addressed? (2) What steps need to be taken to ensure the intervention will be pro-equity, whereby the technology solution will not reinforce the inequity gaps for the most marginalised learners - for example, does the interface account for varying literacy levels, low/non-literate, specific gender, age or broadly speaking design for children vs youth, and adaptive technologies and design for children and youth with disabilities. Do adults/guardians need to be sensitised to the value of girl learners having access to the technology solution? (3) What are the specific barriers to technology access and use for the target beneficiaries, e.g., adolescent girls, children and youth with disabilities, or children and youth in refugee camps?

- ❑ **Monitoring and Evaluation:** (1) How will the intervention be monitored and evaluated for learning outcomes?
- ❑ **Cost and Ownership:** (1) What is the total cost of ownership, taking into consideration the cost of maintenance (including updates) and on-going training? Is there a one-time fee or recurring costs? (2) If there is material being developed for the technology solution, who has the copyright over the content or the solution? (3) If there is data being collected, who owns the rights to the data? (4) What are the additional costs for adaptive technologies for children and youth with disabilities?
- ❑ **Resources:** What materials or resources are necessary for the intervention to be successful? For example, for the technology intervention to be successful, there might be a need for storage space or security measures to be taken to prevent theft.
- ❑ **Usability and user experience:** Can the developer provide usability and user experience information from previous implementations? If a developer has not been selected, then how will they collect this information?
- ❑ **Updates:** How can the product changes be made? How long does it take to make changes? It is possible and sometimes necessary for changes to be made over the course of the intervention. If making changes is a hassle or cumbersome, then the tool can become irrelevant and lead to users abandoning the solution.
- ❑ **Technical Support:** Is technical support provided, and how? Is it available on-site and on-demand?
- ❑ **Technical Requirements:** What are the technical requirements (hardware and software) for the solution to operate?
- ❑ **Data and Security:** (1) What are security risks of using the technology solution? What security measures are in place? (2) How is the collection of sensitive information handled? (3) How will the user be informed/sensitised regarding data and security issues?
- ❑ **User feedback:** (1) How will the primary users and stakeholders contribute to product development? For example, user requirements data can be gathered before development or usability testing can occur during the development of the solution to collect user feedback to inform the programme and product.
- ❑ **Future development:** Is there a road map or a future development plan for the solution? How will this be facilitated?

Chapter 2 | Types of Technology Solutions and Learning Modalities

This Chapter becomes relevant once the context and scope of work is well defined, and the education challenge and need for a technology solution is well articulated (see *Checklist A* in the previous Chapter). It provides guidance on the various ways in which technology can enable learning, their advantages and disadvantages, and relevance for specific use cases.

2.1. How technology enables learning

This section outlines the different types of modalities and modes of learning enabled by the use of technology, and how technology can improve learning and provide flexible learning opportunities vis-à-vis traditional approaches to learning.

2.1.1 Learning Modalities

For learners and the training of teachers, there are varied types of instructional and engagement, as well as space and time, modalities used with hardware and software tools.

Space and time modalities

Given that certain technology tools can be used remotely, instruction and learning can take place in four different ways: **Face-to-Face (F2F)**, **Remotely**, **Asynchronously**, and **Synchronously**. F2F is the traditional modality where the learners and the instructors meet at the same time and space. Remote modality refers to when the source of instruction is in a different space and time than the learners. The asynchronous modality concerns learners and instructors interacting at separate times, such as communication via discussion forums. The synchronous modality applies to when the instructor and the learners are engaging with each other at the same time, which could be F2F but also during remote instruction and learning.

Instruction modalities

Instruction can occur on a spectrum between **self-directed** and **direct instruction**. Self-directed instruction refers to when the learner is making the decisions about crucial elements of the learning process, such as pace, *without* the support of external facilitators or instructors. Direct instruction is when the learning process is pre-determined and delivered by an instructor such as when a professor conducts a lecture.

Showcase 1. Children and Youth with Disabilities (India) – Digital library books for blind and print disabled persons

Country: India

Technology Solution: Access to digital library books for blind and print disabled persons

Mode of Learning: Self-Directed



One specific challenge that children with vision impairments face is access to accessible reading materials. Sugamya Pustakalaya is India's largest accessible digital library for blind and print disabled persons. This digital library is a collaboration between three partners and the government of India with the goal of reducing the 'book famine' that blind persons face. The library is free of charge with proof of a disability certificate and has more than 3, 28,900 books. This digital library provides the opportunity for children and youth with vision impairments to enhance their learning through the use of audio books provided in various languages and only requires a laptop, phone, or tablet to utilize the technology. This technology is self-directed and provides students with the autonomy to set the pace of their own learning.

Showcase 2. Adolescent girls (Bangladesh) – Access to digital devices

Country: Bangladesh

Technology Solution: Access to digital devices and classes

Mode of Learning: F2F

The English and Digital for Girls' Education (EDGE) club which is run by the British Council and the social development organization, BRAC, in Bangladesh



recognizes that South Asian adolescent girls face many barriers when it comes to accessing the internet and owning mobile phones in this region. Due to fears that such access will encourage girls to challenge paternalistic societies, families allow sons to use and own mobile phones while girls have little access. Furthermore, the high cost of mobile phones and a lack of financial independence prevents girls from owning mobile phones. The idea that girls seldom understand technology only serves to reinforce patriarchal beliefs. EDGE is helping to close this gender disparity by leading non-formal, community-based English clubs designed to provide adolescent girls from marginalized communities access to digital devices. This project has allowed 7,000 girls in seven regions of Bangladesh to learn about health, human rights, to speak English and obtain jobs.

Engagement modalities

As with instructional modalities, engagement via a technology solution can span from being **passive to active**. Passive participation is where learners are not interacting with the content while active

engagement involves learners interacting and co-creating the learning experience. Educational games are a great example of how a technology solution can actively engage learners. One great example is Can't Wait to Learn educational games developed by War Child, showcased below, where children in conflict and remote areas use tablets with loaded games to actively engage in learning.³

Showcase 3. Displaced Youth – Access to tablets for educational games

Country: Sudan, Jordan, Lebanon and Uganda

Technology solution: Educational Games - on tablets

Mode of learning: Self-Directed

Can't Wait to Learn utilises innovative, custom gaming technology to deliver quality education. The evidence-based programme was developed by

War Child and partners through years of testing

and research. The educational games allow children to learn at their own pace. Children who already have some knowledge can quickly go through the games. After completing a series of exercises, the software automatically unlocks new exercises at a higher level – making it possible for children to progressively acquire new skills.



2.1.2 Modes of learning

Based on a review of technology solutions and relevant literature, five different modes of learning were identified: Self-Directed/Self-Regulated, Personalised, Distance, Mobile, and Blended Learning.

Self-Directed Learning (SDL) and Self-Regulated Learning (SRL)

Remote and low-resource environments create difficulties for learners and teachers to have access to quality educational opportunities. To accommodate these challenges, it is common to find technology solutions that provide access to repositories of materials and to online courses as a substitute for the traditional classroom with an instructor or F2F training for teachers. Such solutions require the learners or teachers in training to **self-direct** and **self-regulate** their learning process.

Self-directed learning involves the learner managing their education through the use of material with minimal to no support. This applies to what is described as minimally invasive education, where learners are left to acquire the knowledge on their own or through peers. Technically, self-directed learning is, “a process in which individuals take the initiative, with or without the help from others, in diagnosing their learning needs, formulating goals, identifying human and material resources, choosing and implementing appropriate learning strategies, and evaluating learning outcomes.”⁴ This process can happen in an organic manner when learners are exposed to educational content without an external structure to manage the learning experience. For example, with respect to teacher

³ <https://www.warchildholland.org/projects/cant-wait-to-learn/>

⁴ Knowles, M. S. (1990). The adult learner: A neglected species (4th ed.). Houston: Gulf Publishing.

training is the British Council's resources for teachers to teach English.⁵ A teacher accessing the website would be engaging in SDL when surveying the material on the website and selecting the content that is the most appropriate for them in their professional development.

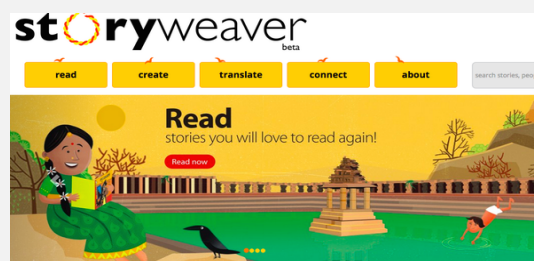
Showcase 4. Out-of-School Youth & Teacher Training (India) – Open Educational Resources

Country: India

Technology solution: Open Educational Resources (OER)

Mode of learning: Self-Directed

[Storyweaver](#) by Pratham Books is an example of an OER where learners are given access to educational content that they navigate through on their own (self-directed). The online platform has stories available in 153 different languages on topics ranging from mathematics to life skills. Learners who are out of school can find materials appropriate to their age level and level of reading abilities. Teachers in training can use such a resource as content to be taught in informal education settings or to increase their own reading skills.



When one is enrolled in online courses that are synchronous or asynchronous and from a distance, they are no longer self-directing their learning because the courses provide a structured plan; instead, they are **self-regulating** their learning. It is called self-regulated learning when one is regulating their learning experience by directing cognitive activity and socio-emotional factors, such as motivation, towards achieving specific goals.⁶ For online courses, one has to self-regulate learning by being actively engaged and motivated to learn, be prepared to handle challenges, manage their time and complete tasks, and utilise resources to meet deadlines and master the concepts being taught. It is important to note that though there is a level of self-regulated learning that happens even in classroom settings, with self-directed learning there is a heavy reliance on SRL.

Having the support of an individual outside of the technology solution is necessary because SDL and SRL can be very challenging, especially for those from the most vulnerable contexts. For instance, when looking at learners pacing themselves through educational content, this does not always lead to positive learning outcomes. Not all students engaged in a self-paced environment succeed. Tullis and Benjamin (2011) pointed to how, “The advantage of self-pacing was apparent only in subjects who utilised a discrepancy-reduction strategy—that is, those who allocated more study time to normatively difficult items. Self-pacing can improve memory performance, but only when appropriate allocation strategies are used.”⁷ Essentially, students’ learning outcomes depend on the strategies they use when controlling the pace. Developing learning strategies is not always possible for adolescents and youth who might have never attended formal schooling or are otherwise unable to attend schools, which is a prevalent theme amongst the scenarios outlined for this report.

⁵ <https://www.britishcouncil.in/teach/resources-for-teachers>

⁶ Loyens, S. M., Magda, J., & Rikers, R. M. (2008, December). Self-Directed Learning in Problem-Based Learning and its Relationships with Self-Regulated Learning. *Educational Psychology Review*, 20(4), 411–427. doi:<https://doi.org/10.1007/s10648-008-9082-7>

⁷ Tullis, J. G., & Benjamin, A. S. (2011). On the effectiveness of self-paced learning. *Journal of Memory and Language*, 64(2), 109–118. doi:10.1016/j.jml.2010.11.002

Furthermore, given the contexts outlined in the five scenarios of focus, it is very likely that learners from such contexts have experienced either trauma or chronic stress. The influence of trauma on the development of an individual is being understood in more detail, and its influence on learning is coming to light. The current research points to difficulty in self-regulation if trauma has affected the development of the prefrontal cortex and executive functions.⁸ In fact, the “Hear from Teachers: getting refugee children back to learning,” report by Save the Children, notes the number one challenge in refugee education as being psychosocial issues that have detrimental effects on a child’s ability to learn.⁹

Showcase 5. Adolescent Girls & Out-of-School Youth (India) – ICT-Enabled classes

Country: India

Technology Solution: ICT-enabled classes (e.g., via classroom TV)

Mode of Learning: Asynchronous



Digital Learning Centres, implemented by Plan India in partnership with Ericsson, uses technology solutions to help educate young girls aged 15-25. They provide access to quality education within their communities and aim to increase the number of girls accessing the internet. Due to safety concerns, adolescent girls are not able to travel long distances to attend school. To overcome the barriers of limited mobility and address patriarchal and socioeconomic challenges, Digital Learning Centres has thus far provided ICT-enabled classes to over 15,000 girls across Delhi’s urban disadvantaged communities. Each learning centre has a facilitator who helps the teacher manage the large digital board while also ensuring smooth communication between teachers and students. Aside from teaching important classes such as Mathematics and Science for 9th and 10th standards, this programme is designed to reduce the number of out-of-school girls.

When asking learners to engage in self-directed or self-regulated learning, it is necessary to acknowledge the challenges posed by such a learning model and to provide support accordingly.

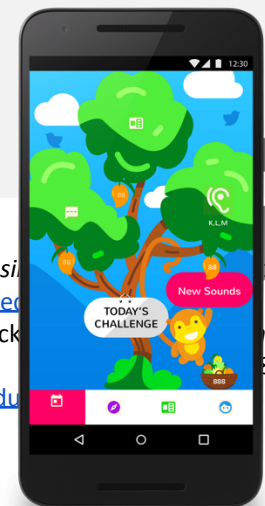
Showcase 6. mGuru – Teacher Training & Out-of-School Youth (India) – Gamification app

Country: India

Technology Solution: Gamification App mGuru

Mode of Learning: Personalised Learning

mGuru is a free English and math gamified learning app that is interactive



⁸ Welsh, A. (2013). *Effects of Trauma Induced Stress on Attention, Executive Functioning, Processing in Urban*. Retrieved from Seton Hall University Dissertations and Theses: <https://scholarship.shu.edu/>

⁹ Mason, Claire, and Shannon Orcutt. “Hear It from Teachers: Getting Refugee Children Back to School.” *Save the Children*. www.savethechildren.org/content/dam/usa/reports/ed-cp/hear-it-from-the-teachers-refugee-edu

and engaging, works offline, and is offered in four languages with the aim of reaching all children in India. The app is based on educational games and friendly competition and has the ability to address learning gaps to improve each users' skills in English and math. The fun and engaging app can be accessed via tablets, smartphones, and even low-cost phones, thus making it widely available. mGuru provides feedback to teachers and parents on their students' progress and usage, providing them with insights on each users' levels and capabilities. mGuru also offers training to teachers on how to use the app to ensure they can confidently incorporate the educational technology in their classrooms.

Educational games are a great way to offer self-directed and/or self-regulated learning. Research has shown that digital education games can have a positive effect on learner engagement.¹⁰ Educational games have also been shown to have positive effects on learning and encourage intrinsic motivation amongst learners.¹¹ With educational games tapping into intrinsic motivation, and increased engagement from learners, they can support individuals who are challenged by the experience of trauma or adversity to self-regulate their learning experience. Apart from learning, games can be used for psychosocial support for those who experienced trauma. For example, visuo-spatially demanding games such as Tetris have the potential to be effective in reducing intrusive memories.¹²

Personalised learning

Another learning mode that was prevalent amongst the technology solutions investigated for the scenarios is personalised learning, which is becoming increasingly prevalent. Though there is no specific and universally accepted definition of personalised learning, it includes:

- the adjustment of pace and sequence of content based on the learners' level of mastery;
- access to educational materials from anywhere at any time to allow learners to learn at their own convenience;
- learners engaging in interest-driven work;
- learners having the agency to determine their learning experiences;
- providing individualised support.

All of these factors can be facilitated with the use of technology solutions. Technology has been especially helpful in determining the baseline level of mastery and for gathering relevant learner data to manage and provide a personalised learning experience. Among the solutions surveyed for this report that have been implemented in contexts similar to the scenarios, the use of adaptive learning

¹⁰ Annetta, Leonard & Minogue, James & Holmes, Shawn & Cheng, Meng-Tzu. (2009). Investigating the impact of video games on high school students' engagement and learning about genetics. *Computers & Education*. 53. 74-85. 10.1016/j.compedu.2008.12.020.

¹¹ Tüzün, Hakan, Yilmaz-Soylu, Meryem, Karakus, Türkan, Inal, Yavuz and Kizilkaya, Gonca. "The effects of computer games on primary school students' achievement and motivation in geography learning." *Computers & Education* 52 , no. 1 (2009): 68-77.

¹² <http://www.yalescientific.org/2017/11/tetris-as-therapy/>

technologies (ALT) is prominent. ALT is designed to record data and present content based on learners' level of content mastery and for providing individualised scaffolded support and instruction.

In education, **scaffolding** refers to the breaking down of concepts into manageable units which make it easier for learners to build on their understanding. ALT keeps track of learner's data, such as performance on exercises and quizzes, to provide scaffolded support. For example, based on the data captured by the ALT, if a learner does poorly on a long division problem, rather than providing general information about how to do long division, scaffolded support will target a specific area such as the conceptual understanding of multiples.

Using performance data that is captured by ALT for each learner, along with individualised scaffolded support, **differentiated instruction** can be provided to each learner. This instructional approach builds on the idea of the **zone of proximal development**, the area between what one can do on their own and next step towards progressing their ability with competent support.¹³ By differentiating instruction to accommodate one's zone of proximal development, ALT are able to provide effective personalised instruction. An example of using ALT is the Mindspark platform featured below.¹⁴

Showcase 7. Out-of-School Youth (India) – Personalized learning platform

Country: India

Technology solution: Personalised learning platform

Mode of learning: Personalised learning

An example of a personalised learning platform using ATL developed for the Indian context is [Mindspark](#), which uses data to gauge the learning level of every student and customises the material being delivered to match the level and rate of progress made by each student. Additionally, it analyses student data to identify patterns of errors, and targets associated content to address conceptual understanding. Given that Mindspark can be appropriate in a variety of settings (informal and formal), it can be accessed via smartphone, tablets and computers and it can be used both online and offline; these qualities make it a compelling tool for use in low resourced or remote environments.



For teachers who lack adequate training and have minimal subject knowledge, it can be especially difficult to handle large classes and provide individualized support and instruction to each student; in particular, help the lowest-performing learners and boost those who can move ahead faster. In such contexts, ALT can enable teachers to interact with students more effectively, which can lead to

¹³ <https://www.edutopia.org/blog/scaffolding-lessons-six-strategies-rebecca-alber>

¹⁴ Muralidharan, K., Singh, A., & Abhijeet, J. A. (2018, 11 01). *Disrupting education: Experimental Evidence on Technology - Aided learning*. Retrieved from National Bureau of Economic Research: [https://econweb.ucsd.edu/~kamurali/papers/Working%20Papers/Disrupting%20Education%20\(NBER%20WP%2022923\).pdf](https://econweb.ucsd.edu/~kamurali/papers/Working%20Papers/Disrupting%20Education%20(NBER%20WP%2022923).pdf)

improved learning outcomes.¹⁵ In circumstances when there are no qualified teachers, a technology solution offering personalised learning could be considered.

Though similar projects are still limited in the region to support enhanced teacher training, there is a trend in offering personalised training. The personalization process can include one or more features such as the ability for teachers to access training materials from any location at any time, or teachers having the choice to select training material of interest. Scaffolding is also relevant and concerns breaking down materials into smaller units that can be processed at one's own pace of learning, of increasing difficulty (ideally identifying and starting at the level of the learner). An example of such a solution is presented below called Micro-credentials, offered by Digital Promise.¹⁶

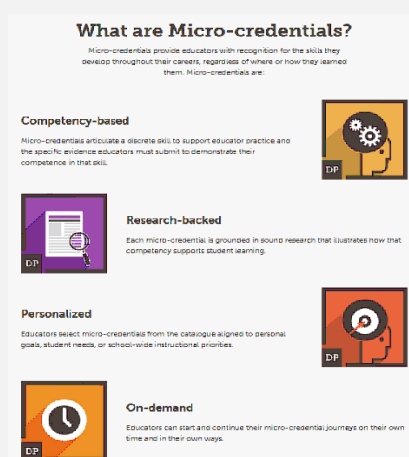
Showcase 8. Teacher Training – OER-e-modules

Technology solution: OER - e-modules

Mode of learning: Personalised learning

An example of using technology for personalised training is offered by Digital Promise, a non-profit organization working to close the digital learning gap. They host a repository of micro-credentials modules. They promote micro-credentials as being competency-based, research-backed, personalised, and on-demand. The modules scaffold the teacher training process by breaking down the skills and knowledge into smaller units of learning for which teachers can earn micro-credentials.

There are about 380 modules that are categorised based on larger topics called stacks. For example, there is a stack of modules for refugee educators developed by Carey Institute for Global Good. The stack contains three modules for refugee educators (such as Cultural Proficiency & Culturally Sustaining Pedagogy in Refugee Education). The e-modules do not use ALT but by offering the content online, elements of personalised learning, such as allowing for self-pacing and working at their own time, are available to teachers.



Mobile learning (mLearning)

Learning anytime and anywhere has been facilitated with increased internet and telecommunications coverage coupled with increasing affordability of mobile phones and tablets. Mobile learning (mLearning) is leveraging access to portable devices such as tablets and phones for providing meaningful learning experiences. Given that cell phone ownership and use has increased dramatically across all regions and demographic groups, providing mLearning on cell phones lends itself to be a viable solution for all the listed scenarios. For instance, refugees often carry a phone with them,

¹⁵ Michaëlle Tauson, and Luke Stannard. "EdTech for learning in emergencies and displaced settings: a rigorous review and narrative synthesis." *Save the Children*, 2018, <https://resourcecentre.savethechildren.net/library/EdTech-learning-emergencies-and-displaced-settings-rigorous-review-and-narrative-synthesis>

¹⁶ <https://microcredentials.digitalpromise.org/>

versus books or learning materials, to stay in touch with family and access money transfers.¹⁷ Under such circumstances, mLearning can be provided via cell phones, providing a highly applicable medium for delivering quality educational experiences.

mLearning can be used with instruction that is either F2F or provided remotely, asynchronously, and synchronously. It can also be used for promoting active and self-directed learning. When surveying the technology solutions employed for learners and training teachers, mLearning has been used for different objectives such as for language acquisition, improving numeracy skills, career counselling, and job-skills training.

With the use of smartphones, the options are far broader to include educational applications and access to distance education. The use of SMS and audio courses offering learning opportunities can be used both on smart- and feature- phones, making these courses an especially relevant solution for scenarios where the learners and teachers might not have access to the latest smartphones. Essentially, mobile phones can be transformed into low-cost learning devices. With appropriate partnerships, the cost to the end user can be minimal. Featured below is a great example of mLearning for low resourced and remote environments called Ustad Mobile.¹⁸

Showcase 9. Teacher Training & Out-of-School Youth (Afghanistan) – Learning platform on Feature phones

Country: Afghanistan

Technology solution: Learning platform on Feature phone

Mode of learning: mLearning

The Ustad Mobile ('mobile teacher') Literacy mLearning project aims to make literacy education software available at a more affordable price to Afghans, including those who are non-literate and living far from urban centers, through the use of a simple feature phone. The application runs offline on simple feature phones available in small mobile shops and bazaars throughout the country. The entire national literacy curriculum—from the first letter of the alphabet through grade 3 literacy and numeracy- is available in both Dari and Pashto. Ustad Mobile Literacy has been approved by the Ministry of Education and is now being used by literacy classes of adult women and Afghan National Army recruits in Kabul.



A noteworthy report that explored the potential of technology solutions in low resourced and remote areas such as refugee communities is UNESCO's "A lifeline to learning: Leveraging mobile technology to support education for refugees". The report specifically investigated the value of using mobile technologies in providing education for refugees based on three categories: addressing challenges related to the individual, educational system, and educational levels.¹⁹

For teacher training, the report points to projects focused on mobile teacher training (such as the Teacher for Teachers initiative). There are preliminary findings regarding the use of mobile

¹⁷ <https://phys.org/news/2018-05-mobile-refugees.html>

¹⁸ <https://blogs.worldbank.org/edutech/model-educational-technology-development-afghanistan>

¹⁹ "A lifeline to learning: Leveraging mobile technology to support education for refugee." UNESCO, 2018

micro-content and mobile messaging for providing support towards improving teaching practices; such interventions are applicable for the first scenario in training facilitators with minimum to no teaching experience. An example of using mobile coaching is the pilot project in Kakuma Refugee camp highlighted below.²⁰

Showcase 10. Teacher Training (Kenya) – Mobile mentoring

Country: Kenya

Technology solution: Mlearning - mobile mentoring

Mode of learning: Personalised learning

A teacher training programme called Teachers for Teachers initiative in Kakuma Refugee piloted a programme where mobile phones are used for coaching and mentoring teachers. This programme provides refugee teachers the opportunity to absorb what they have learned in the classroom and to test and adopt new strategies for teaching.

In the case of mobile mentoring, the mentors are supported in providing guidance to novice teachers in an on-demand manner that allows the coaching to be just-in-time and responsive while sustaining the training outcomes over a longer period of time. The mobile phones become a low-cost mLearning tool reinforcing the training through coaching.



For the individual learner, the UNESCO report highlighted the lack of sufficient evidence about the efficacy of using mobile technology for low language and literacy skills. However, mobile learning programmes can support “refugees’ knowledge acquisition while enhancing their psychological well-being.” Concerning primary and secondary education, the report notes the lack of projects which have been rigorously evaluated for impact and implemented at scale.²¹

Along with the advantages of using portable mobile devices, there are also challenges that need to be addressed associated with learning. The UNHCR report about refugees and connectivity recorded the lack of content in the local language, along with low digital literacy levels, as potential barriers. The report stated that “Since much of the internet and many mobile applications are in English, large numbers of refugees with limited or no English skills are prevented from using them. There are also variations across age groups and backgrounds, with younger people tending to be more computer literate while refugees who hail from towns and cities have, as a rule, higher levels of digital literacy than those originally from the countryside.”²²

By following some of the emerging best practices for learning with technology, such as to not just provide access to content but to focus on adapting the content to be contextualised, localised, and

²⁰ <https://www.tc.columbia.edu/refugeeeducation/teachers-for-teachers-kakuma/>

²¹ <https://reliefweb.int/sites/reliefweb.int/files/resources/261278e.pdf>

²² “Connecting Refugees: How Internet and Mobile Connectivity can Improve Refugee Well-Being and Transform Humanitarian Action.” 2016. UNHCR - <https://www.unhcr.org/5770d43c4>

engaging rather than being passively consumed by users, projects can mitigate the challenges of low literacy and language barriers.

Distance learning

Distance learning is a mode of learning where the learner is not in the same space as the instruction, and it can be synchronous as well as asynchronous. A synchronous case would be where learners are logging into a video conference to listen to a live lecture. An asynchronous case would be when learners are accessing pre-recorded lectures at a later time.

This mode of learning allows for access to education to be available no matter the location of the learner or the teacher in training. The prevalent versions of distance learning that emerged from the research are Open Educational Resources (OER), and Massive Open Online Courses (MOOCs) which are a type of OER.

Showcase 11. Out-of-School Youth & Teacher Training (India) – Open digital infrastructure for educational resources

Country: India

Technology Solution: Open digital infrastructure for educational resources

Mode of Learning: Self-Directed

EkStep is an open digital infrastructure in India that provides access to online learning materials for millions of children and youth and offers professional development for teachers to improve their teaching quality and content knowledge. EkStep provides teachers with quality assessment tools, worksheets and activities for in-class use, and offers a variety of engaging content for various age groups. These materials are entirely open and can be accessed by children who are both in school, or out of school with the use of a computer or a mobile device. The various forms of content delivery, such as explanatory videos and interactive worksheets make the learning process fun and engaging.



Showcase 12. Teacher Training & Adolescent Girls (India) – Digital labs and mobile apps

Country: India

Technology Solution: Digital labs, mobile app

Mode of Learning: F2F and self-directed

British Telecom and British Asian Trust have partnered to launch a programme to use digital technology to help improve education and life skills for adolescent girls in India; their aim is to use technology solutions to reduce



social barriers. Furthermore, the pact recognizes that many jobs are reliant on digital technology, hence technological literacy will greatly improve the girls' employability. The partnership will work with organizations already on the ground to deliver the program. For example, it will coordinate with IT for Change, which will create digital labs in schools to train girls and teachers, and video clubs that enable girls to create digital learning materials that will be used for peer learning. Going to School is another organization that will design content for young people that connects employability and skills training to keep up with changing gender norms, including games, movies, lessons and cases, which are taught through direct delivery in schools and a mobile app.

The rise of online learning in the development context was especially aided by open educational resources that are available free-of-cost to users. OER can be any educational content (videos, audio, websites, digital games, and other multimedia) or software that allows for learning, such as the [Moodle](https://moodle.org/) platform, that is free of cost for hosting online courses.²³ One of the more popular types of OER is the massive open online courses (MOOCs), which can be offered by universities and other educational institutions. [Coursera](https://www.coursera.org/refugees) is an example of a site that curates and offers MOOCs on a learning platform with the possibility of earning certification at the completion of the course. In 2016 they started offering their full catalogue of courses at no cost for [refugees](https://www.coursera.org/refugees) by working with programme partners.²⁴

The OERs and MOOCs can be accessed through any device that has a connection to the internet such as mobile phones and devices, tablets, computers, and laptops. The resources can also be downloaded and made available offline. There are many examples of the use of Learning Technologies such as OER and MOOCs for distance learning. There are nationally recognised OER providers available within the region. In **India, there is SWAYAM**, a programme initiated by the Government of India to provide access to quality content to bridge the digital divide and reach the most disadvantaged learners. The platform offers all courses offered from 9th class to post-graduation.²⁵ **Sabaq Foundation Trust in Pakistan** provided a platform with over 11,000 video lectures and practice tests for all regions of the country spanning across various subjects from grade level 6 to 14 in Urdu.²⁶

Showcase 13. Children and Youth with Disabilities & Teacher Training (India) – Massive Open Online courses (MOOCs)

Country: India

Technology Solution: Massive Open Online Courses (MOOCs)

Mode of Learning: Self-Directed

Massive Open Online Courses (MOOC) are changing the education system for children with special learning needs in India. Teachers are able to utilize the free MOOCs through platforms such as Coursera and EdX and can enroll their students in various courses based on interest, capabilities, and learning levels. These courses are particularly useful for students with learning disabilities, such as

²³ <https://moodle.org/>

²⁴ <https://www.coursera.org/refugees>

²⁵ <https://swayam.gov.in/>

²⁶ <http://sabaq.pk/>

difficulties with reading, or students who have short attention spans. The unique courses offer short and engaging videos instead of textbook learning, and students can replay the videos repeatedly until they confidently understand the concepts being taught. The videos are followed by short quizzes that test for key concepts and provide feedback to the students on their progress. Teachers who have implemented these courses in their classrooms for students with special needs have noticed an improvement in overall learning and educational attainment, as well as a heightened interest in students' willingness to learn.

Additionally, there are numerous MOOCs that teachers can take themselves in order to improve their own learning as well as teaching practices. For example, teachers can complete courses that inform them about the best practices for teaching students with disabilities.

Given the plethora of choices for OER and MOOCs, there are **learning object repositories** which curate material and provide a means for users to select relevant content. For example, one such platform is called [Kolibri](https://learningequality.org/kolibri/), which was designed for low-resource communities such as rural schools, refugee camps, orphanages, non-formal school systems, and prison systems. The content on the platform is available in multiple languages, on and offline, and is self-paced.²⁷ It is also designed to be used by both individual learners and instructors which helps support teachers and can be used for teacher training.

The higher attrition rate associated with distance learning than in-person classes is a noted phenomenon. When an exploratory study was conducted to identify barriers, eight factors were identified: academic and technical skills, learner motivation, time and support for studies, cost and access to the internet, and technical problems.²⁸ Specifically for MOOCs, a survey was conducted of over a hundred learners who dropped out and a review of public records from 42 MOOCs points to a few reasons for attrition: lack of time due to other responsibilities, a sense of isolation and insufficient social support, lack of interactivity, not enough prior knowledge or skills, and hidden costs.²⁹ When looking at OER, there are barriers such as lack of access to technology, difficulty with finding material and assessing their relevance and context, lack of individual resources and the quality of the content.³⁰

Showcase 14. Teacher Training – Massive Open Online Courses (MOOCs)

Scenario: Teacher training

Technology solution: Distance learning – MOOC

Mode of Learning: Self-Directed

MOOCs are offered to teachers specifically, such as the one developed for training on how to teach struggling



²⁷ <https://learningequality.org/kolibri/>

²⁸ Muilenburg, Y. L., & Berge, L. Z. (2007). Student barriers to online learning. *Distance Education*, 26, 29-48. doi:10.1080/01587910500081269

²⁹ Gutl, C., Rizzardini, R. H., Chang, V., & Morales, M. (2014). Attrition in MOOC: Lessons learned from drop-out students. *Learning Technology for Education in Cloud. MOOC and Big Data*, 37-48

³⁰ Percy, T., & Van Belle, J.-P. (2012). Exploring the Barriers and Enablers to the Use of Open Educational Resources by University Academics in Africa. . *IFIP International Conference on Open Source Systems - OSS 2012: Open Source Systems: Long-Term Sustainability* , 112-128.

readers around the world. The course was launched by World Learning in partnership with The Chinese University of Hong Kong. The course is self-paced and upon completing the teachers will receive a badge. The course is hosted on a learning management system which can be accessed on any device.

There are approximately 6,000 participants from the U.S., Pakistan, Lebanon, Nepal, Algeria, Zambia, India, the Philippines, and many other countries. All the readings and instructions have been developed to accommodate for participants with intermediate or higher levels of English proficiency.

Given the barriers identified through research, some of the emerging recommendations for learning with technology can provide a means to overcome the challenges. For example, meeting the learner at their level of understanding/mastery mitigates the barrier of learners not having enough prior knowledge or skills. Contextualizing and localizing the content will ensure OER is relevant for the learners' environment. To combat the sense of loneliness and lack of support, active guidance has been studied as an effective strategy.³¹ Active guidance involves having a coach or a mentor rather than having the learner interact with just the technology; this strategy aligns with not replacing but supporting the teacher/mentor/coach with the use of technology.

Blended learning

Another mode of learning that was prevalent in the research and appropriate for all the listed scenarios is blended learning; where learners are using technology part-time while interacting with a facilitator, teacher or peers as well. All devices, including TV and Radio, can support blended learning as they can be used alongside working with an instructor, facilitator, or a group of learners.

In comparison to other modes of learning, blended programs do require more human resources, which make them a challenging option to offer given the scenarios listed for this report. However, blended learning is prevalent in low resourced and remote environments because it can yield better learning outcomes and ensures learners or teachers are adequately supported to take advantages of Learning Technologies. Given that learning for young adults or teachers is a dynamic, cognitive, and social-emotional process, it benefits from blended pedagogy rather than standalone technology interventions. Additionally, as noted earlier in this chapter the primary users of learning technologies in the five scenarios examined by this report may have experienced trauma or chronic stress, which can greatly inhibit one's ability to learn independently, making blended learning and pedagogy a very appropriate option.

[Multinet Sabaq](#) is a non-profit organization in Pakistan that is offering a blended learning programme for out-of-school children. Sabaq provides training for community educators to facilitate sessions where learners use a personalised learning platform on a tablet. This model is proving to be effective because the facilitator is able to fill in the gap for support and guidance that the learning platform does not provide, which relates well with an emerging best practice of technology supporting the teachers/facilitators versus replacing them.

³¹ Schmidt-Jones, Catherine. 2017. "Offering Authentic Learning Activities in the Context of Open Resources and Real-World Goals: A Study of Self-motivated Online Music Learning." *European Journal of Open, Distance and E-Learning* 112-126.

In fact, UNESCO's report about mobile phone use for refugees noted in their analysis of Massive Open Online Courses in the refugee context,

*"shows that the success of digital learning courses in refugee higher education contexts has little to do with magnitude, openness or exclusively online delivery. Instead, digital higher education courses tend to be most valuable if they are connected with blended learning approaches that provide additional online and offline learning and support structures, and if they are integrated into a broader curriculum that leads to certification and degrees."*³²

Showcase 15. Adolescent Girls & Teacher Training (Egypt) – Literacy app

Country: Egypt

Technology solution: Literacy App - on mobiles and F2F

Mode of learning: Blended Learning

Knowledge is Power is a literacy programme that targets primarily illiterate girls above the age of 15 located in Egypt where only a third of women are literate. Adolescent girls in Egypt face many barriers to becoming literate, including inability to attend distant classes, which particularly impacts girls from rural communities.

The technology solution is a free mobile application named Vodafone Literacy App that uses pictures and a talkback feature for ease of learning. The app may be used on one's phone from anywhere, which removes the barrier of distant classes and commuting. The app is complemented by intermittent face-to-face classes in accessible venues, such as local community centres, schools, mosques/churches, and even homes of volunteer teachers - many of whom are women. Importantly, girls in rural areas have easier access to the programme due to the strong local presence of three local NGOs: The Life Makers Foundation, Coptic Evangelical Organization for Social Services (CEOSS) and Rotary Egypt. Additionally, teachers can enhance their literacy skills and education techniques through workshops.

Another example of a mLearning is a programme called Learning Links that is being piloted in Liberia for improving numeracy and literacy of girls who are out of school due to pregnancy. Numerate and literate women are trained in the Liberian Ministry of Education's Alternative Basic Education curriculum and connected to girls in their community. A woman from the community who has basic qualifications then works with these girls in a community-based education model. Short Messaging Service (SMS) based evaluation questions are used to track learners' progress by having each learner submit their answers after the tutor-mentor covers a unit of content. Micropayments are provided to both learners and tutor-mentors via mobile phones for learning performance.³³

From a programme perspective, the importance of adult/mentor/teacher involvement as key to deeper engagement is supported by the Landscape Review for ICT4E in Conflict and Crisis. The review

³² "A lifeline to learning: Leveraging mobile technology to support education for refugee." UNESCO, 2018

³³ <http://www.thekaisencollege.com/project/learning-links/>

highlights the use of human resources, facilitators or teachers, as being essential for the success of the educational initiatives and projects.³⁴ Given the programmatic benefits of having adult/mentor/teachers involved, blended learning becomes a strategic approach to offering Learning Technologies for all the scenarios.

2.2. Hardware, infrastructure and software

This section provides a brief overview of the various hardware and infrastructure requirements of EdTech solutions, as well as different types of software and software design.

2.2.1 Hardware and infrastructure

A range of hardware can be considered for implementing Learning Technologies:

- Computers- initiative such as [One Laptop per Child](#) use cheap and durable laptops to deliver educational content.
- Tablets are being used for 1:1 device initiatives or given to teachers for training or to support instruction. Users can access media rich content (such as educational games or applications) that is either pre-loaded or can be accessed via internet.
- eReaders are being used to make reading materials available at low cost and provide access to content in mother tongue language to learners.
- TVs are being used to broadcast programs covering topics ranging from lifeskills to English language learning.
- Radios serve as both educational content providers through informative broadcasts as well as instructional aid with Interactive Radio Instruction.
- Smartphones are being used in a similar manner to a tablet to provide access to media rich content, educational games, and applications along with SMS services and IVR are being used to provide educational materials.
- Feature phones are specifically being used for SMS and IVR while some are providing innovative learning management platforms to offer e-courses.

Factors to consider when considering hardware include:

- Risk of theft;
- Additional resources needed, such as requirements for housing and securing the equipment;
- Accessibility for users with disabilities / special education needs;
- Sustainability of the hardware in the long term can be costly, especially when considering how battery life shortens over time and needing human resources for upkeep and maintenance. If any parts need to be replaced which cannot be found locally, then it can make it challenging for maintaining the equipment in the long run.
- Note that the content is generally a more important determining factor for success than the hardware. Even with the latest tablets with long battery life and designed to work in rugged

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environments, if the content on the devices is not accessible, valuable, and following sound pedagogy, then the success of the intervention is compromised.

There is a lack of evidence on the effectiveness of technology interventions especially for the specific scenarios and contexts considered in this report. Interactive radio instruction is an exception in that it has been extensively researched and tested with positive results.³⁵ IRI programs require teachers and students to react verbally and physically to questions and exercises posed by radio characters and to participate in group work, experiments, and other activities suggested by the radio program.³⁶

Showcase 16. All Scenarios (South Asia) – Interactive radio/audio instruction

Scenario: All Scenarios

Technology solution: Interactive radio/audio Instruction

Mode of learning: Blended Learning

Education Development Center (EDC) is a leader in developing curriculum and teacher training for interactive radio instruction (IRI). IRI requires a radio or an audio device and an adult facilitator. With the use of radio or audio devices, the programme can reach large numbers of teachers and learners who are unable to access a formal education system. It can be used in various settings and work with limited infrastructure, from refugee camps to remote communities.

“IRI and IAI have been primarily viewed as vehicles for student instruction. But their dual-nature structure—teaching teachers as they teach students—makes them powerful vehicles for teacher instruction, too.” (<https://www.globalpartnership.org/blog/making-radio-waves>)

When looking at low cost and scalable solutions, educational content delivered via Radio, TV, and accessible on a feature phone (which is more affordable and likely to be purchased even by young people) can be appropriate. The Radio and TV programming can be aired outside of regular school hours to make it more accessible to youth. TV programming can be as innovative such as the case with using subtitles to teach literacy, “that combines eye-tracking technology with karaoke-like subtitles that help people learn the words at the same rate as they’re spoken or sung,” in Bollywood movies.³⁷

Audio courses made available on a feature phone can support literacy while SMS based content could support numeracy. TV or Radio programming can include the use of SMS by asking viewers to submit questions or answers or encourage them to sign up for courses. It is also important to note that a mentor/facilitator is key to the effective use of such technology solutions which makes blended learning very pertinent with any hardware tool that is used.

2.2.2 Software and design

The following types of software are commonly used for Learning Technologies implementations:

³⁵ <http://blogs.worldbank.org/edutech/energy/iri>

³⁶ Anzalone, S., & Bosch, A. (2005). Improving Educational Quality through Interactive Radio Instruction: A Toolkit for Policy Makers and Planners. Washington DC: The World Bank.

³⁷ <http://www.bbc.com/future/story/20170920-could-india-use-bollywood-to-improve-literacy>

- Adaptive learning technology (ALT), as discussed in the personalised learning section, is used to capture learners' data and accordingly deliver content;
- Educational games can be found across many learning domains and are typically used to engage learners more actively and make the learning experience more enjoyable. A related concept is gamification, which is the introduction of game-like elements to non-game (educational) contexts, to introduce the advantages of games (e.g., increased engagement, user-friendly design) to such contexts.
- Educational apps (applications) available on mobile devices which work on specific learning goals such as language learning, reading or mathematics. These can include games, but also learning tools (such as dictionaries), eBooks, quiz-based apps and apps hosting online courses and educational videos.
- Learning Management Systems (LMS) are used to administer and deliver online educational content. A popular, globally used open-source LMS is Moodle³⁸, which can be used to deliver a wide range of educational content and apps to track learner progress. That includes open educational resources (OER), which are freely accessible, openly licensed materials and resources for teaching and learning.
- SMS-based educational programmes/interventions such as Eneza³⁹ which supports learning by providing low-cost quizzes and related products via SMS. Users can access the educational content (such as lessons, assessments, chatting with a live teacher) by sending a text to a shortcode.
- Audio courses such as the one described in the English in Action example below where mobile phone service enables anyone to learn and practice English by calling a mobile shortcode, from any Bangladeshi mobile operator. More than 7 million people have accessed 3-minute audio lessons for the cost of less than 50 paisa per minute.⁴⁰

Factors to consider in software design are:

- Data breaches and online safety concerns. Adaptive learning technologies require the collection and the storage of large volumes of student data, colloquially called big data. This data is mined for patterns to characterise an individual's learning. Technology solution providers need to be held accountable by requiring them to make the data anonymous and to ensure that learners' right to distribution and use of their information is protected. As a best practice noted by Principles of Digital Development, the use of data must be monitored and properly managed to protect the rights of end users.⁴¹
- Quality of the content can vary greatly depending on the provider. Open educational resources (OER) (such as courses and educational videos) can be posted online by anyone including those with no teaching experience, or little subject matter expertise, so quality varies greatly. Moreover, caution is needed in considering such free content, especially if it has not been vetted by experts.
- Digital literacy levels of users - are the primary user groups already familiar with software such as SMS or navigating online courses.

³⁸ <https://moodle.org/>

³⁹ <https://enezaeducation.com/>

⁴⁰ <http://www.eiabd.com/>

⁴¹ <https://digitalprinciples.org/>

- Especially when working with out of school youths or teachers from disadvantaged backgrounds, literacy and numeracy levels need to be considered for the interface of the software. If there is too much text and the reading levels are low among the primary users, then the solution will be ineffective.

Showcase 17. All Scenarios (Bangladesh) – T.V. and mobile phone instruction

Country: Bangladesh

Technology solution: TV and mobile phone

English in Action developed multi-platform services for learning English affordably via mobile phones, the web, television programmes, print media and peer-to-peer learning.

They innovatively use **television** with the project's two biggest educational technology solutions – drama series called *Bishwas* and associated educational game show *BBC Janala – Mojay Mojay Shekha* ("Learning with fun"). They have been able to reach 20 and 18 million people respectively.

The **mobile phone service** enables anyone to learn and practice English by calling a mobile shortcode, from any Bangladeshi mobile operator. More than 7 million people have accessed 3-minute audio lessons for the cost of less than 50 paisa per minute.



2.3. Advantages and disadvantages of commonly used technologies

Listed below is a table that summarises relevant tools or technologies implemented for learning and training within low resourced and remote areas. The table is adapted (with some additions) from the Save the Children's report "EdTech for learning in emergencies and displaced settings: a rigorous review and narrative synthesis"⁴². It is recommended that this table is consulted when going through the Checklists (Chapter 1) for scoping and exploring Learning Technologies options.

Types of tools	Advantages	Disadvantaged	Examples
Hardware			

⁴² Michaelle Tauson, and Luke Stannard. "EdTech for learning in emergencies and displaced settings: a rigorous review and narrative synthesis." *Save the Children*, 2018, <https://resourcecentre.savethechildren.net/library/EdTech-learning-emergencies-and-displaced-settings-rigorous-review-and-narrative-synthesis>

Laptops or computers	- Usually, are placed in centres that can provide additional support; - Can develop computer literacy skills such as typing, using a mouse, and an operating system; - Text-to-speech and other computer-based adaptations can make this technology more accessible for children/youth with disabilities.	- Computers (not laptops) are stationary devices that require learners to be in one place at a specific time. - Requires longer training time in comparison to using a tablet or a phone; for example, training to use a mouse/keyboard takes longer than using a touch screen.	One Laptop per Child
Tablets	- Immediate feedback is possible; - Can be used to administer assessments; - Can be operated and used with limited infrastructure; - It is a mobile device that facilitates more interactivity and user-generated content.	- Expensive; - Cost and portability make it a higher risk for theft; - Diminishing battery life over time; - Can be easily damaged by drops and spills.	LEARN: Neighbourhood-based blended learning for adolescent Syrian refugees
Smart Phones	- Same as the tablet; - Facilitates anytime and anywhere learning; - Can reach out-of-school learners; - Relatively cheap; - Programme costs are cheaper given that phones are usually owned by the learners.	- Screen size can limit interactivity or presentation of content; - Data packages can be a considerable cost for families; - Battery life can be an issue; - Can be easily damaged by drops and spills; - Younger learners might not have access to phones; - Does not facilitate computer literacy skills such as typing.	mGuru Gamification app

Feature Phones	• Same as the tablet and smartphone; • Simpler to use than smartphones or tablets; • Battery life is longer for feature phones; • Spare parts might be more readily available; • Relatively cheaper than smartphones;	• Limited functionality in terms of software capability; • Screen size can limit the resolution of images or videos; • Limited or no accessibility options for learners with disabilities; • Can be easily damaged by drops and spills; • Data packages can be a considerable cost for families; • Younger learners might not have access to phones; • Does not facilitate computer literacy skills such as typing.	Mobile literacy programme in Afghanistan
eReaders	• Large storage capacity for books on each device; • Can promote literacy skills; • More cost-effective than buying books; • Use in conjunction with lessons and teachers; • Can promote positive parenting skills such as reading with children.	• Limited by the availability of books in particular languages; • Limited functionality to only reading and listening; • Needs facilitation depending on reading level.	Worldreaders' Blue Box - contains everything needed to bring digital reading to a school: e-readers, e-books and Worldreader's expertise.
Radio	• Infrastructure often established in the country; • Multi-generational medium; • Multi-user medium; • Promotes inclusive education; • Useful for mother tongue education; • Relatively cheap – especially solar-powered radios; • Can be far-reaching depending on the broadcasting signal; • Cost-effective in terms of reach versus device cost; • Low maintenance costs; • Can be applicable for basic literacy skills;	• Access to a radio is not guaranteed; • Radio signal might not be stable and strong enough, especially in remote areas; • Challenging to teach more complex concepts without visual aids for subjects such as writing. • Not accessible for children and youth who are deaf or have hearing impairments without access to hearing aids.	Broad Class – interactive radio instruction programme in Pakistan

Television	• Multi-user medium, though limited by the size of the TV and capacity of speakers. • Audio content available via flash drives offline.	• Lack of interactivity with the medium; • No offline use; • Need to be connected to the grid for electricity; • Not suitable for children with visual impairments.	English in Action's drama series, "Bishaash," and the accompanying game show BBC Janala - Mojay Mojay Shekha ('Learning with Fun') enabled 20 and 18 millions of people respectively to learn English.
Storage Device	• Large storage capacity for different types of educational materials; • Can promote literacy and numeracy skills; • More cost-effective than buying books; • Use in conjunction with lessons and teachers; • Device agnostic in terms of access to material on the device;	• Can be limited by the availability of educational materials in local languages and contextualised; • Will need on-site technical support; • Can be updated only via internet connection; • Technical maintenance can be an issue.	BRCK - educational content can be stored on the device. Anyone who connects to the device can access the content. Webbox - The WebBox, designed by the Vodafone Group, is equipped with a learning application for the classroom that contains state curriculum-aligned digital content.
Software			
SMS Based content	• Easy to access and can be simple to use; • Can provide basic level of personalization – provide content that matches learner's level of mastery; • Can be available on a feature phone.	• Limited modes of interactivity leading to limited types of skills that can be developed, for example, learners will not be able to learn typing skills.	Eneza Education - SMS based test preparation and lessons offered to users.

Educational Apps	• Easy to access and can be simple to use; • Make use of social, situational and experiential learning; • Certain apps offer accessible platforms for persons with various disabilities; • Available in multiple languages; • Can provide varying levels of personalization;	• Availability of high-quality content in multiple and local languages can be limited; • Cost of high-quality platforms can be prohibitive. • Content quality can vary across different platforms; • High quality platforms might not be available on devices accessible to those who are the most disadvantaged. • Ease of use of different platforms can be varied.	English Duniya - App for learning English
Adaptive learning technology	• Provide personalised learning; • Can provide content that matches learner's level of mastery; • Assessment can be more customised; • Adaptation to local curriculum, language and context could be easy.		Mindspark Khan Academy
Digital Educational Games	• Easy to access and can be simple to use; • Designed for a high level of engagement; • Can be language agnostic depending on the content;		Can't-Wait to Learn

Chapter 3 | UNICEF Guidance for Planning and Managing EdTech Initiatives

This UNICEF report contributes to the guidance offered by other 2018 reports by the Education team in HQ and a joint report by the WCAR/ESAR offices. Although those reports examined a broad range of technical areas within the Education sector where UNICEF can begin to support the increased use of technology, several of the recommendations offered in those reports are also relevant to the specific scenarios of teacher training and reaching out-of-school youth examined in this report.

UNICEF is recognizing the increasing importance of technology in the education sector and needs to start getting involved in areas where we currently focus our programming.

UNICEF brings the following unique strengths to planning, managing or contributing to an EdTech initiative:

- Bringing an equity lens to EdTech and focusing EdTech implementation on reaching disadvantaged children and youth, including adolescent girls and children and youth with disabilities;
- Trust and credibility in its convening role around children's rights;
- Field presence and on-the-ground experience working in education, also through its partnerships with (I)NGOs;
- Strong collaborations with Government, often as a long-term trusted development partner, and very often as grant agent and/or coordinating agency for GPE countries;
- Access to international resources, research and expertise.
- Including the inputs and voices of children and youth, such as on selecting appropriate interventions and programmatic goals, understanding how ICT is used and valued by youth, and recognizing their ability to negotiate and navigate digital environments.
- Leveraging UNICEF's convening power to cultivate and nurture the EdTech ecosystem by:
 - Fostering innovation clusters locally, within different regions associated with the field offices as well as nationally, who can be supported by leveraging UNICEF's diverse network of experts and practitioners;
 - Increasing local capacity for developing solutions for adolescents;
 - Advocating for internet access from a human rights perspective;
 - Increasing radio signal to reach all communities;
 - Promoting third-party evaluations of EdTech solutions.⁴³

However, UNICEF also faces certain constraints in the area of EdTech, in particular a lack of in-house technical expertise in the area of EdTech. This makes it all the more important to collaborate and establish partnerships on EdTech, as successful development and implementation requires a diverse portfolio of skills and inputs.

4.1. Guidance for UNICEF Country and Field Offices

- Broadly speaking, it is important to include the Government from the beginning in scoping and consultations for potential EdTech interventions. This is also **to take into account Government expectations and approval** which may be required, and any potential sensitivities around use of EdTech, especially in emergency/conflict settings.
- It is crucial to reach out early to key partners and stakeholders working in this area, who can advise on bottlenecks faced and ways to go about them, explore options for collaboration, and **to avoid reinventing the wheel**. In addition, it can be beneficial to reach out to private sector providers which have already developed relevant EdTech solutions which could potentially be adapted, or could support potential scale-up, or otherwise complement UNICEF's work in different areas.

⁴³ <https://hechingerreport.org/the-dark-side-of-education-research-widespread-bias/>

- Within UNICEF, it is important to reach out to other sectors implementing technology for development initiatives, to identify **opportunities for mutual benefit and collaboration rather than working in silos**. There may be opportunities to implement technology interventions in collaboration with other sectors, such as WASH in schools, life skills education with Child Protection, etc.
- Connect with **monitoring and evaluation** colleagues as early as possible to ensure progress towards meeting key objectives is monitored and appropriate and timely follow-up actions can be taken. As well as **communication and C4D** colleagues, to ensure appropriate dissemination and communication of UNICEF's work on EdTech. It is also important **to reach out for support to the T4D focal point in the country or regional office link-up to HQ T4D, Education and Innovation sections for advice and guidance**.
- Periodic or ad-hoc strategic moments and platforms can be used as opportunities to explore and scope the **potential for EdTech within existing programmes**, for example: Joint Sector Review, new ESA/ESP, new SitAn, new CPD/PSN development, MTR, SMR, development of the Sector Work Plan, new Development Partners Group meetings when a new Government is elected. All of those special moments offer the opportunity to discuss the potential for an EdTech solution in response to an identified issue/challenge, and those discussions can take place in a consultative manner, with potential early buy-in and participation from the Government.
- Finally, **consult with Management/Planning, PME/ICT-T4D focal points, including also regional office and HQ colleagues (education, T4D, innovations)**. For example, to get support on making the business case for an EdTech solution, developing ToRs, reviewing technical solutions or bids from EdTech providers, to implementation and evaluation support.
- The provided **checklists in Chapter 1 are there to support this work**, the “Context and Scoping Checklist” helps identify the potential of EdTech and make the case for a solution if relevant, and the subsequent checklist (“Planning and Design”) is used to guide EdTech planning, product and programme design, implementation and other aspects, paying particular attention to equity dimensions. The two checklists were developed to ensure the bottlenecks are overcome and the common mistakes are avoided by following best practices and recommendations.

4.2. How Regional Offices and HQ can support EdTech at country level

1. Identification and implementation of strategic entry points and directions for supporting EdTech, as described in Chapter 5 - Next steps.
2. Identifying of key leverage points to adopt EdTech solutions to address common challenges in countries.
3. Supporting the costing and scaling up of EdTech interventions.
4. Identification and recruitment of EdTech consultants and experts to support the work.
5. Identifying and linking with private providers of EdTech solutions.

6. Facilitating opportunities to document, collaborate and share good work supported by UNICEF on the ground, and encourage cross-fertilization across UNICEF field/country/regional offices and development partners.
7. Organizing capacity building opportunities for colleagues in countries and in the field around EdTech solutions.
8. Building the evidence base by initiating or encouraging the evaluation of promising solutions.

Chapter 4 | Best Practices, Recommendations and Next Steps

This Chapter highlights the emerging best practices and recommendations to consider when utilizing technology initiatives to accelerate education programming for specific use cases, as well as next steps for advancing EdTech in South Asia for disadvantaged children and youth.

4.1. Best Practices and Recommendations

Technology has incredible *potential* to reach an exponentially larger number of people at a fraction of the cost of previous training and learning modalities, but at the same time it has often failed in achieving objectives and expectations. There has been a tremendous amount of hype in recent years, especially from private sector companies with large stakes in their own platforms, around initiatives such as computer labs in classrooms and youth clubs working with platforms using artificial intelligence engines to allow for self-paced learning. However, after an in-depth review of Learning Technologies initiatives in South Asia and around the world, there is still limited independent evidence that illuminates exactly “what works.” One consistently emerging recommendation is to **not to rush** into starting a technology initiative before considering its relevance given the challenge and context (see Checklist A), and if relevant, planning its design and implementation (see Checklist B).

Furthermore, throughout this process it is important to keep in mind three key findings which emerged from the review of technology for learning initiatives, research, as well as consultations with country and field offices: the need for an **equity focus** which is too often missing, determining **value added** of technology over business-as-usual approaches, and how to ensure **long-term sustainability**.

(i) **Equity focus.** An important element of any technology for learning initiative is to identify potential barriers to up-take by disadvantaged children and youth and seek to address this from the initial stages of planning and implementation. This concerns reaching areas without ICT infrastructure, as well as addressing barriers beyond 'access', such as language, low literacy, disabilities or special education needs, lack of familiarity with ICT, restricted mobility and other socio-cultural barriers for adolescent girls, etc. This is usually not (explicitly) done, and the most disadvantaged children and youth are often least likely to benefit from EdTech initiatives. This is where UNICEF can and should play a key role.

(ii) **Value added.** The added value of a technology initiative over and above business-as-usual approaches is often not described, however, in any UNICEF supported/driven EdTech initiative this along with the focus on disadvantaged populations needs to be front-and-center and crystal clear. This second point is linked to the recommendation that the focus should never be on the technology or platform, but on how the **use** of the technology solution will lead to learning, and improve learning, in ways that cannot be done without technology (or at least, not as cost-effectively). Often, the best way to do this is **not** by focusing on learners, but on the teachers (as teachers, or facilitators,

are the most important factor influencing learning)! It further links to the need to monitor the effectiveness of the initiative, and ideally, evaluate its impact on learning.

(iii) **Long-term sustainability.** Technology initiatives in the Education sector are often very costly - it is expensive to develop the software platforms, courses and content, to purchase and maintain the required hardware and even ICT infrastructure, to train and employ facilitators, and to manage the initiative. This needs to be weighed carefully along with the identified value added. Technologies that can operate with limited ICT infrastructure (e.g. battery-powered tablets with offline learning materials), low-cost technologies (e.g. feature phones and radio), free and open source software, and free adaptable/translatable educational content are all ways to drive costs down. However, at least as important are partnerships with development partners and the private sector to share and mitigate costs, for example, building on existing (partner) ICT infrastructure, materials and programmes using technology in the same geographical areas of focus or reaching the same intended target beneficiaries. This is where UNICEF's strength as a convener can be strategic to help ensure long-term sustainability and cost effectiveness.

The following table presents key emerging trends and recommendations taken from the lessons-learned of these 25+ initiatives, as well as the other guiding documents listed in Annex B. Some select examples of recommendations include:

- Technology solutions are not a silver-bullet on their own, but instead should be integrated as part of a blended-learning model where the ability for a user to speak with a mentor also exists;
- Content must be translated into the language(s) that the key user groups are most comfortable with;
- Following Human-Centered Design best practices, key stakeholders must be part of the process from the very beginning to ensure that the technology solution is the best fit for their context;
- Data protection concerns and local laws must be considered from the very beginning of the planning process.

Key Bottlenecks and Common Mistakes	Best Practices and Recommendations
Insufficient consideration of equity dimensions. If equity is not taken into account throughout all stages of planning, development and implementation, the most advantaged will disproportionately benefit and the most disadvantaged and marginalized are least likely to benefit (this has been referred to as the Matthew Effect in EdTech).⁴⁴	Focusing on equity helps technology development identify bottlenecks such as literacy, affordability, and skill gaps. After identification, these limitations can be addressed by the design and development of the solution and the program. Programmatically:

⁴⁴ <http://blogs.worldbank.org/edutech/miga/matthew-effect-educational-technology>

For example, if a pilot for the solution is conducted in schools equipped with ICT literate teachers and all the required ICT infrastructure and facilities, but is also intended for schools in more challenging environments with teachers unfamiliar with ICT, unreliable power and Internet and other issues, then clearly such issues will be poorly addressed and the solution is likely to fail in such contexts. Additionally, even in a relatively disadvantaged community, more advantaged children (who are more literate, more exposure to technology) will disproportionately benefit if this is not addressed strategically. Furthermore, girls face additional barriers to accessing technology. They may be prohibited from accessing or owning a mobile phone, and have more limited opportunities to develop digital literacy. For learners with disabilities, technology offers both solutions and barriers. While there is great untapped potential in the use of adaptive technologies, more often than not, learners with disabilities face barriers in using and benefiting from technologies.	• The selection of where the technology solution will be first piloted should reflect the most challenging conditions of use within the context. For example, rather than choosing to pilot a programme at the most well-resourced learning centre in a refugee, a learning centre that is the most resource constricted would be selected instead. • Ensure there is sufficient training, especially for the most disadvantaged users and all stakeholders not just the primary users. • Provide sensitisation workshops to ensure that the adults/mentors/ facilitators and key stakeholders are culturally accepting of the technology solution and are ready to ensure all users can use the solution. Solution Design and Development: • To address the issue of affordability, making content available both online and offline to make sure end users are not limited by their access to connectivity and data plan; • Identify and address equity-related barriers to use, including barriers to usage by adolescent girls and learners with disabilities.⁴⁵
Low literacy levels of key target beneficiaries	Solution Design and Development: • Rather than making a platform just text based on the mobile phone, interactive voice response (IVR) can be used to increase participation amongst those with low or no literacy skills, and learners with visual impairments; • Using solutions which do not rely on literacy, such as radio, television, and audio/graphics-based mobile apps (with little or minimal use of text), audio and (in

⁴⁵https://static1.squarespace.com/static/5b8d51837c9327d89d936a30/t/5bbe7bd6085229cf6860f582/1539210418583/GE_VO_Full_Report.pdf

	case of mathematics apps) numbers and not text.
Lack of (ICT) skills and competencies to leverage the use of technology	Solution Design and Development: • Taking into account the lack of ICT literacy of users into the design and implementation of the solution; • 'Scaffolding' the use of the solution - which consists of starting simple and gradually introducing and explaining more complex steps when the user is ready for it. • User-friendly designs that are intuitive even for those unfamiliar with ICT.
Lack of consideration of the characteristics and needs of target beneficiaries in design and development	Programmatically: • Feedback from the target community must be collected at the planning stage as well as throughout the implementation process. Solution Design and Development: • User-centred design requires collecting feedback in terms of usability and user experience to ensure that the solution will be adopted and effective.⁴⁶ Recommendations for effective learning: • Contextualizing content is crucial and it includes presenting content in the language that primary users understand and making the content relevant to users by presenting examples or references that are relatable, and applicable to their context.
Poor training protocol for users as well as key stakeholders	Programmatically: • Training for primary users, especially to address digital literacy gaps, is necessary. • Providing teacher professional development is crucial for technology solution to be used and integrated into practice. • Apart from the primary user, it is important to consider the adult/mentor/teacher who supports the use of technology solution, because they contribute to more productive engagement. Consequently, training needs to be provided to not just

⁴⁶ <https://www.usability.gov/what-and-why/user-experience.html>

	primary users of the technology solution but also the adult/mentor/teacher. • All training must be provided before and during implementation as well as available for the duration of the solution used by the target community.
Lack of consideration for social and cultural norms especially in the initial planning phase. For example, if adolescent girls are the target beneficiaries but social and cultural norms prevent many of them from accessing a mobile phone, then a mobile-based solution is inappropriate.	Programmatically: • Perceptions held by the community and teachers of using technology for learning need to be considered given that these perceptions influence the sustainability of the intervention. The perceptions need to be recorded and addressed through the design and development process. • It is important to differentiate implementation to be country-specific based on an understanding of factors related to cultural outlooks and practices in education and the use of ICT. Solution Design and Development • The solution must be designed for not just the primary users but also accounting for families (adults), who can encourage the use and support the technology solution.
Prioritisation of the technology over and above the learning and programmatic factors which are more critical to successful implementation. For instance, if tablets are purchased for learners but insufficient attention is given to providing relevant content meeting the needs and capabilities of target beneficiaries, or if proper teacher/facilitator training is not provided (programmatic factor), then they will likely fail to improve learning outcomes.	Recommendation for effective learning: • Content must be prioritised over the technical solution - it is necessary to identify the learning goals and selecting appropriate and high-quality material before considering the device or specific technology solution. From a pedagogical perspective • Technology solutions need to engage learners actively rather than just providing access to the material; • The content needs to be adapted to the user's level of learning to facilitate progression; • Learners need to be able to learn from their mistakes when using the solution; • Technology solutions should follow instructional design principles, such as being learner-centred, founded on principles of how people learn, and

	learning assessment needs to be both formative and summative; Technology solutions must support teachers or facilitators instead of being used as a replacement; this recommendation was discussed in detail when looking at blended learning.
Use of content created for users in a context dissimilar to the one where the technology intervention is to take place, without localizing/adapting them For example, taking ebooks meant for children in the United Kingdom and using them in Afghanistan.	Recommendation for effective learning: Localizing content involves ensuring the material represents the community's locality, social, and cultural norms.
Lack of piloting, monitoring and evaluation. This leads to the implementation of untested technology solutions, and inadequate follow-up to ensure the technology solution meets set objectives.	It is challenging to find rigorously tested technology solutions which makes monitoring and evaluation with a focus on learning outcomes especially important. When possible, it is also good practice to ask the vendor to provide data/reports regarding the efficacy of their solution. Programmatically: Monitoring and evaluation have to be integral versus afterthoughts with a focus on learning outcomes.
Lack of consideration of cost-effectiveness and sustainability. For example, disregarding long-term total cost of ownership including maintenance and ongoing training costs, and the added cost of adapting/implementing technologies to reaching learners with disabilities.	Programmatically: Along with considering the hardware cost, it is more crucial to consider operation, maintenance, and on-going training costs.
Infrastructure barriers are not considered for sustainability of the intervention. Given that infrastructure, such as power supply or phone coverage, can be limited for low resourced and remote environments, it is	Programmatically: - Long term infrastructure needs must be identified and taken into account when considering different technology solutions. Solution design and development: - Infrastructure limitations should be used as key criteria for design and development.

necessary for the technology intervention to be operational under such conditions.	
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4.2. Next Steps

This report has brought together key guidelines and recommendations on how to best select, plan, design and implement EdTech interventions, particularly in difficult and resource-poor contexts, lacking ICT infrastructure, and for disadvantaged populations. There are many innovative EdTech initiatives, some implemented at large scale, but most are not (independently) evaluated.

There is very little information on how cost-effective these initiatives are, and what their impact on learning is. In the future, it will be important to **invest more in independently evaluated high potential EdTech initiatives**, in terms of their impact on learning vis-à-vis a traditional non-EdTech approach, as well as their cost-effectiveness, potential for scale-up and sustainability. A suitable evaluation methodology would need to be found (or developed) specifically for EdTech, adaptable to the wide range of contexts in which UNICEF operates.

What is also required is a comprehensive **mapping of EdTech solutions in low and middle-income countries, and their characteristics**. This would require the development of a EdTech taxonomy for classifying and categorizing such EdTech solutions through useful comparative criteria. This would allow those seeking to implement a new EdTech initiative to find the most relevant examples given a specific challenge and context. A simple evaluation framework could be developed to identify relevant and high potential EdTech solutions for inclusion in the mapping, taking into account that for many EdTech initiatives, documentation is very limited.

A similar **mapping / collating of open educational resources (OER)** would also be useful. Such mappings already exist (e.g. www.oercommons.org), but are generally oriented towards English speaking, developed contexts.

Furthermore, it is common to reinvent the wheel, and cost-effective implementation of EdTech solutions would benefit from a more **modularized approach to EdTech where a new EdTech initiative could build on top of the success of other initiatives**. That is, it could borrow from existing ideas, plans, strategies, software and open source code, open educational resources (OER), hardware innovations, and so on, and adapting these to suit different contexts and purposes. A mapping of EdTech solutions as well as better documentation and improved sharing of EdTech software, hardware/technologies, content and documentation, could support this.

An **initiative or platform is needed for sharing such EdTech resources and innovations to promote sharing, collaboration and knowledge exchange** - similar to existing initiatives for sharing free educational resources. In short, what is commonly shared is the bits and pieces of EdTech (such as individual educational videos, online courses), but to a much lesser extent, the entire package (including the surrounding technologies, software and code, platforms, content, documentation, etc., with a few notable exceptions such as Moodle). Of the many great examples in this report -- how many allow you to fully download their software or content, and adapt it for your own use? And why

not? There may be many reasons for this, such as to maintain control and protect vested interests, avoid scrutiny, lack of funding, or more broadly a lack of a culture of sharing and collaboration.

It is also important to acknowledge the more-complex landscape of education technologies and platforms, involving LMS (learning management systems), MOOCs (massive open online courses), assessment and certification systems, education management information systems, education dashboards, and many more. **Guidance is needed on how to integrate the use of technology in the Education sector within the existing technological landscape, education ecosystem, and structures which have been set up by the government at various levels.** In the (relative) absence of such structures, how can technology solutions help build them, for example within the mainstream education system, linking assessment and certification processes, and so on.

Finally, what is also needed is the **establishment of (stronger) partnerships between key organizations working at global, regional, national and sub-national levels on EdTech**, including government, UN agencies, (I)NGOs, incubators, research groups, think tanks, donors and funding agencies. Too often, organizations are working in parallel on EdTech initiatives but using similar technologies or tools, tackling similar challenges and equity issues, and addressing similar target populations. This is where UNICEF could play a convening role.

Appendix A: Key Guiding Documents for learning about ICT use in low resourced and remote environments

Resource	Location
Designing effective education programmes using ICT	http://medalliance.wpengine.com/wp-content/uploads/2016/07/Bloome.pdf
Education in Conflict and Crisis: How Can Technology Make a Difference? A Landscape Review	http://www.educationinnovations.org/research-and-evidence/education-conflict-and-crisis-how-can-technology-make-difference-landscape
A framework for evaluating the appropriateness of EdTech use in global development programs	http://cite.mit.edu/system/files/reports/Summary%20Report_A%20Framework%20for%20Evaluating%20Appropriateness%20of%20Educational%20Technology%20Use%20in%20Global%20Development%20Programs.pdf
The EduTech blog of Mike Trucano	http://blogs.worldbank.org/edutech/
mEducation Alliance	http://www.meducationalliance.org/
Centre for Education Innovations	http://www.educationinnovations.org/topics/educational-technology
Promising practices in refugee education	https://www.promisingpractices.online/
This publication summarizes a forthcoming academic review paper on education technology, “Upgrading Education with Technology: Insights from Experimental Research.”	https://www.povertyactionlab.org/sites/default/files/documents/education-technology-evidence-review.pdf
Hear it from the teachers: getting refugee children back to learning	https://www.savethechildren.org/content/dam/usa/reports/ed-cp/hear-it-from-the-teachers-refugee-education-report.pdf

Supporting teachers with mobile technology: Lessons drawn from UNESCO projects in Mexico, Nigeria, Pakistan and Senegal	https://unesdoc.unesco.org/ark:/48223/pf0000251511
Education in Conflict and Crisis: How Can Technology Make a Difference? - A Landscape Review	https://www.ineesite.org/en/resources/landscape-review-education-in-conflict-and-crisis-how-can-technology-make-a
The future of learning and technology in deprived contexts	http://s3.amazonaws.com/inee-assets/resources/the_future_of_learning_and_technology_2018.pdf
HundrED - is a not-for-profit organization, which seeks and shares inspiring innovations in K12 education	https://hundred.org/en/about
Leapfrogging inequality	https://www.brookings.edu/book/leapfrogging-inequality-2/ https://files.eric.ed.gov/fulltext/ED583015.pdf
EdTech for learning in emergencies and displaced settings: a rigorous review and narrative synthesis.	https://resourcecentre.savethechildren.net/library/EdTech-learning-emergencies-and-displaced-settings-rigorous-review-and-narrative-synthesis

Appendix B: Key Features and Constraints of Inexpensive Feature Phones

Note: mobile prices vary significantly from country to country. The below common features are based mainly on phone prices in the Indian marketplace (less than or equal to 15 USD) and may be more expensive in other countries (e.g., 15-20 USD for a 12 USD phone in India). Certain inexpensive phone models may also not be available.

Common features of inexpensive mobile phones (feature phones)

- SMS & Calling
- Camera (though usually no front facing camera)
- Playing video
- Audio for music/ audio course delivery
- FM radio connection
- Bluetooth
- High speed Internet (3G or 4G) and Wi-Fi connectivity
- Email
- Many can open word documents
- Calculator

Features many inexpensive mobile phones do not have which are important for distance learning:

- Audio messaging (sending voice notes, audio playback etc.)
- Video calling
- Language Translation
- Very limited access to apps/platform use, most apps will not functioning (only those specifically designed to run on such phones)
- Touch screen (especially useful for younger learners, children/youth with disabilities)
- Very limited storage space
- Voice commands and other usability features useful for children/youth with disabilities