Education for the Most Marginalised post-COVID-19: Guidance for governments on the use of digital technologies in education

Tim Unwin
with
Azra Naseem, Alicja Pawluczuk, Mohamed Shareef, Paul Spiesberger, Paul West and Christopher Yoo

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Authorship

This report is the outcome of a collaborative authorship initiative and widespread consultation, full details of which are given in Act 2: Annex 1. The lead author and overall editor unless otherwise indicated was Tim Unwin, but all authors as well as members of the team's advisory board contributed extensively to the crafting of this final Report.

Version

Version 3.0

A Report in Three Acts

This Report contains three separate documents (Acts), each of which can be read and used independently. The first is intended for senior government officials and contains a summary of the Report's main recommendations. Act Two provides the detailed exposition, arguments and evidence upon which these recommendations are based, and is intended primarily for those in government who are charged with implementing them. Act Three contains 14 Guidance Notes which provide succinct guidance on delivering important aspects of the overall Report.

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Act One: Executive Summary

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Identifiers DOI***

Executive Summary

If you read no more…

There are five things that a government must do once a holistic vision has been crafted that is committed to using digital technologies to create a resilient education system that provides education and learning for all:

- Create a whole society approach that delivers equity in education;
- Enable access for all to digital technologies by providing resilient funded infrastructures for learning, funded by Central Government rather than Ministries of Education
- Be context specific at all times, especially in terms of the technologies used in education and the content crafted for learners;
- Ensure that appropriate pedagogies are used in the practices of teaching and learning; and
- Use digital technologies wisely and safely.

Above all, it is essential to begin by thinking about the educational outcomes that you want to achieve, and only then seek to identify the technological modalities that best suit your context and financial capabilities.

The purpose of the Report and who it is for

The central purpose of this Report is to provide recommendations to governments in the light of the COVID-19 pandemic about how to use digital technologies to deliver better quality and more resilient education systems that enable everyone to have access to equitable learning opportunities. The pandemic has shown the huge potential of digital technologies, both hardware (including desktop and laptop computers, tablets, mobile 'phones, radios and TVs) and software (including applications, learning management systems, administrative systems, networks, platforms, content and data analytics) to be used to support the delivery of better and more extensive education and learning. However, it has also served as a stark reminder that all technologies can be used to create both positive and negative impacts, and that one of the main effects of COVID-19 has been to increase educational inequalities at all scales.

The Report has been written primarily for senior government officials who have already taken the first steps towards creating fairer and better education systems in their countries, and are thirsty to know more about how they can use digital technologies effectively and appropriately to deliver that vision under the new conditions prevailing as a result of the COVID-19 pandemic. It is also mindful of the financial stringencies resulting from the economic downturn caused by the pandemic, and is very focused on ways through which governments can deliver such benefits whilst also representing real value for money for taxpayers. It is driven fundamentally by a commitment to equity and inclusion within education systems, and consciously

builds on the foundations of existing UN policies and advice such as those included in the Incheon Declaration.

Reading and using the Report

This Report contains three separate documents (Acts), each of which can be read and used independently. This first Act is intended primarily for the most senior government officials and contains a summary of the Report's approach and main recommendations. Act Two provides the detailed exposition, arguments and evidence upon which these recommendations are based, and is intended primarily for those in government who are charged with implementing them. Act Three contains 14 Guidance Notes which provide succinct advice on delivering important distinct aspects of the overall Report. The word "Act" (deriving from Latin *Actus*, meaning an event or something done) for each of these main documents has been chosen specifically as a reminder that we must all take ***act***ion if the poorest and most marginalised are indeed to benefit from the use of digital technologies in education and learning. It is of course also a reminder that it must now be performed for it to come into effect, as in a theatrical play, on the world stage.

This First Act provides a high-level summary of the most important recommendations to help shape better government policies and fairer allocations of resources to and within the education system. It begins with a brief description of how it was crafted collaboratively, and the innovative approach taken in providing these recommendations. This is important for understanding why they should be acted on. It then describes the preconditions that must be in place for its recommendations to be effective. The most important of these recommendations are subsequently summarised under five main headings. In conclusion it addresses questions of financing and the first steps that governments can take to implement the recommendations.

What is innovative about this Report

This Report was crafted consultatively and collaboratively between June and September 2020. Working in the midst of COVID-19 it was impossible to hold face-to-face consultations in person, and so all of the work was done through the use of online digital systems. A core team of seven people undertook this work, supported by a board of eight advisors, including senior government and donor officials. Three elements were especially creative and innovative, helping to ensure that the Report is robust, while also being based on the best possible existing evidence:

- First, it used an innovative consultative process that involved 87 people (43 women and 44 men) from 34 countries in online consensus decision making exercises to identify the five most important areas on which governments need to act when using digital technologies in education systems designed to include the poorest and most marginalised.
- Second, all of the draft materials were shared publicly online (https://ict4d.org.uk/technology-and-education-post-covid-19/) so that people

could provide further recommendations and advice. These suggestions were then used further to improve the report.

- Third, it includes 14 short Guidance Notes (Act Three), that provide specific practical advice on distinct things that need to be done, many of which cut across the five broad themes of the report. These Guidance Notes include boxed checklists that can readily be used to develop context specific checklists, infographics (examples are provided) and programmes to implement change. Many of them were crafted by groups of colleagues from international agencies and organisations committed to delivering truly inclusive education and learning.

Conceptualising the Report

The Report begins by providing an overview of the context, challenges and opportunities provided by COVID-19 for using digital technologies to help create resilient and inclusive education systems (Act Two, Part I). Act Two Part II then provides the core recommendations of the Report. These begin with the overarching recommendation that governments first need to put in place a holistic vision and commitment to the resilient transformation of education and learning that focuses especially on the most marginalised (Act Two, Part II, Section 8). Unless this is in place, education systems will be made more unequal through the use of digital technologies, and the poorest and most marginalised will become ever more marginalised.

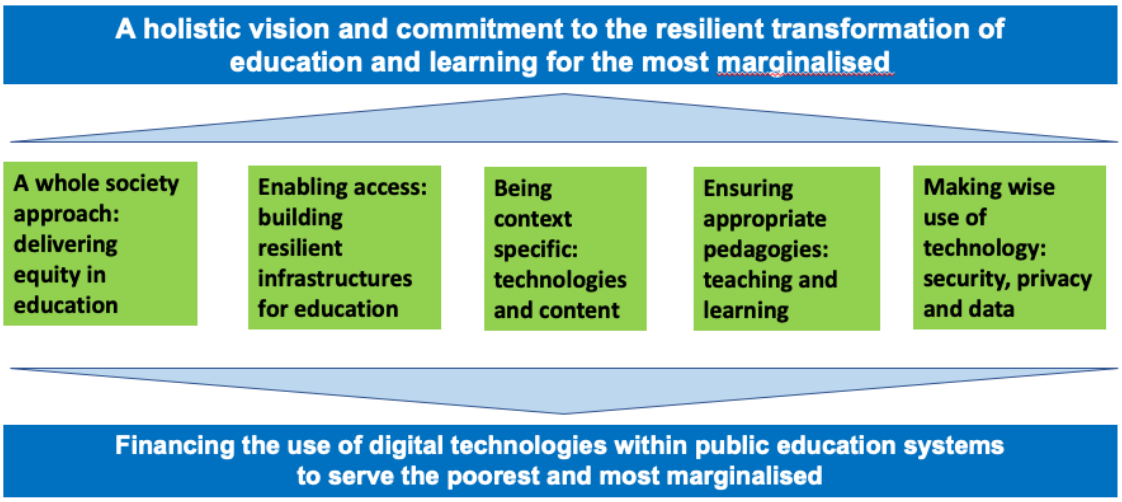
Five sets of recommendations then follow, each grouped around a particular theme (Act Two, Part II, Sections 9-13):

- Creating a whole society approach that delivers equity in education;
- Enabling access for all to digital technologies by providing resilient infrastructures for learning;
- Being context specific at all times, especially in terms of the technologies used in education and the content crafted for learners;
- Ensuring that appropriate pedagogies are used in the practices of teaching and learning; and
- Using digital technologies wisely and safely.

This Executive Summary highlights the three most important practical recommendations under each of these headings, although the full Report (Act Two) contains further specific recommendations that governments are also advised to follow.

A final set of recommendations addresses ways through which these activities can be financed, paying particular attention to contexts where resources are limited, and recognising that different priorities will also be required in varying contexts.

This structure is encapsulated in the diagram below.



In interpreting this diagram, it is important to emphasise that all of the five sets of recommendations featured in green are important, and that the precise ways and order in which they are implemented are likely to vary in different contexts. In practice, most of them are likely to be developed at various rates in parallel, and a core role of those charged with implementation will be to ensure that there is indeed effective coordination between each set of recommendations. Annex 2 of the main Report (Act Two) offers a diagrammatic representation of which Ministries and Regulators need to be involved in overseeing or implementing each of these broad sets of recommendations.

Marginalisation as a process

Marginalisation is the process through which people are excluded from access to resources and opportunities. One of the most profound and important ways through which this is maintained is through differential access to and participation in education systems. Using digital technologies to support the poorest and most marginalised is therefore of critical importance in shaping fairer societies and more productive economies. The most excluded are those who remain completely unseen and unheard. However, there are seven groups of people who have become increasingly recognised by the UN and other organisations as being particularly susceptible to processes of marginalisation, and for whom specific and focused educational actions making use of digital technologies should be taken: out-of-school youth, those with disabilities, girls and women, refugees and displaced persons, ethnic minorities and indigenous peoples, those in isolated areas, and those in informal or irregular employment. Act Three contains specific guidance notes on ways through which governments can most effectively empower people in these groups through the use of digital technologies for learning.

The Recommendations

In the beginning: a holistic vision and commitment to the resilient transformation of education and learning for the most marginalised

Creating a digitally-informed resilient education system requires a whole government approach that involves many ministries other than just the Education Ministry. It must also begin with a profound commitment to the inclusion of the poorest and most-marginalised; digital technologies must be used in ways that serve their needs and interests, and not just those of the rich and privileged. Three key practical actions are necessary for this to be achieved:

- **Crafting leadership and continuity** Heads of State should put in place an experienced senior leadership team to deliver the required educational transformation. In democracies this should be based on cross-party 5-10 year commitments to use digital technologies appropriately to deliver inclusive education. These require absolute adherence to the principle of equity, but must also be sufficiently flexible to adapt to new circumstances (such as COVID-19) and new technological developments.
- **Putting in place a holistic, cross-government approach** It is essential for government leaders and ministries or departments to work collaboratively together to develop and implement a cohesive strategy that delivers effective learning for the most marginalised through the use of digital technologies. At the very least, Ministries of Education, Finance, ICTs/Telecommunications, Infrastructure, Labour, Planning, Internal Affairs/Security and Health/Welfare should be involved, alongside ICT/Telecommunications and Media regulators. This is essential, not least so that coherent, joined-up policies can be developed that provide an integrated approach for infrastructure to be funded centrally, which is particularly crucial in low-resource contexts.
- **Engaging all of society through effective partnerships** Governments need to lead the process of systemic educational transformation, but should put in place clear mechanisms through which all sectors of society own and support it. Such mechanisms will vary depending on national contexts and political systems, but at the very least they need to involve both private sector companies and civil society organisations. The private sector should be valued primarily for its understanding of the technologies, its management expertise, and its focus on sustainability, rather than merely as a vehicle for providing additional funding or technological resources for education systems.

The five most important things for governments to get right in using digital technologies for education and learning by the most marginalised

Once the leadership and commitment are in place, governments need to focus on five inter-related areas through which their strategies and implementation processes should be delivered. The recommendations below summarise the most important

practical recommendations under each heading. These are elaborated in much greater detail in Act Two of the Report.

1. **A whole society approach: delivering equity in education**
2. **Enabling access: building resilient infrastructures for education**
3. **Being context specific: technologies and content**
4. **Ensuring appropriate pedagogies: the practices of teaching and learning**
5. **Making wise use of technology: security, privacy and data**

A whole society approach: delivering equity in education

Ensuring that education systems are equitable implies that resources are allocated disproportionately to those who have most need of them. Put simply, it usually costs more to educate the poorest and most marginalised, and additional resources therefore often need to be allocated to such delivery. Crafting a whole society approach to making such education happen is not only a means of sharing resources more efficiently, but it also enhances a stronger sense of community and greater realisation of the need for continuous learning throughout the life-cycle. As a starting point, to deliver equity in the use of digital technologies in education means beginning where it is most difficult.

This means that pilot projects should not be done where they are easiest to do and are most likely to succeed, but instead with and amongst the poorest and most marginalised, where the circumstances are most challenging, and where most innovation and creativity is required to make them succeed

- **Involving families, learners and communities in the education system** One of the key impacts of COVID-19 has been the realisation that families and communities have a crucial role to play in delivering education, especially in circumstances where access to schools is not possible, be it as a result of a pandemic or physical disasters such as earthquakes or tsunamis. Governments therefore need to put in place mechanisms to involve and support parents, grandparents and other community leaders in helping to deliver effective education for young learners. This is especially significant in supporting out-of-school children and youth. It is also important for governments to put in place formal and informal mechanisms through which learners' voices can be heard and listened to when crafting the content and practices involved in education.
- **Ensuring effective learning for employment** Rapidly changing societies and economies require flexible approaches to delivering learning that is lifelong (throughout the life cycle) and lifewide (involving real contexts and settings). Much traditional vocational training has been insufficiently effective in supporting the needs of employers and in enabling employees to gain fulfilling work. Governments therefore need to put in place and support novel and relevant systems of training using appropriate digital technologies to ensure that everyone has the skills and expertise to find gainful employment.

- **Creating learning environments that promote wellness and wellbeing** The consultations upon which this Report is based highlighted the increased mental stresses in countries across the world caused by lockdown and domestic pressures in circumstances where parents had to work while supporting their children's learning, especially when living in confined and enclosed spaces. It is therefore important for governments to build on the positive lessons learnt from COVID-19 about how digital technologies can indeed be used to support wellness (referring to physical health) and wellbeing (the holistic experience of feeling well and content) in the context of education, rather than simply allowing education systems to revert to an "old normal".

Enabling access: building resilient infrastructures for education

Funding national infrastructure initiatives including school connectivity and power supply should never be a cost placed purely on Ministries of Education that are already overstretched not least in paying teachers' salaries. Rather, they must be a shared responsibility across government through the holistic approach advocated above. Nevertheless, it is impossible for learners to benefit fully from many of the latest digital technologies unless connectivity and electricity are available. Moreover, much can also be done by appropriate use of old technologies (such as radio and TV) in new ways, and it is therefore essential for governments to consider what technologies they should best use to ensure that everyone can have access to basic learning opportunities. For those for whom digital technologies are not feasible, governments need to continue to make available alternative (often paper-based) educational resources and content. These recommendations should be read alongside those pertaining to financing below.

- **Ensuring appropriate and resilient connectivity** Resilience is the ability of education systems to continue or restart operations when schools close due to unforeseen circumstances such as COVID-19. Governments with a high level of resilience act and rebuild quicker than those with fragile systems. Governments need to address four specific issues in order to ensure resilience: continuity of electricity and Internet connectivity; alternative ways through which to deliver distance education (e.g., radio, TV, online learning, mobile phones); ensuring continued instructional and technical teacher support; and creating safe and convenient learning environments.
- **Resolving the challenges in providing access for the most marginalised** Absence of access to digital technologies further marginalises the most marginalised. Governments therefore need to resolve the following main challenges: access to electricity, access to affordable Internet, access to devices, low levels of digital literacy, lack of local content, concerns around safety and security, and social norms. Acts Two and Three provide detailed examples and advice on how this can be achieved. Where digital technologies are unavailable, alternative (often paper-based) resources and content must continue to be provided.
- **Providing infrastructure for lifelong and lifewide learning** Governments need to ensure that they put in place flexible systems that can be adapted and enhanced so that learning provision may readily be continually improved. This

can often be achieved by adhering to Open standards and using Free and Open Source Software (FOSS). It is also important that regulatory systems are designed that serve the interests of learners as much as they do of those who supply digital technologies and content.

Being context specific: technologies and content

There is no one size fits all, universal digital solution, that will deliver appropriate global education for everyone. Governments must understand that context matters, and should resist initiatives by companies intent on offering a single "best" solution. Instead, they should draw on the many good examples highlighted in Acts Two and Three of this Report, carefully to craft the most appropriate uses of relevant digital technologies for their own social, cultural, political and economic context.

- **Being technology agnostic: balancing older and future technologies** Governments need to ensure that the appropriate technologies are used to deliver the optimal services in any specific context. To this end, it is important for governments to be technology agnostic, meaning that they should not place all of their investments into one particular kind or model of technology, but instead set educational objectives and then explore ways of providing the optimal technological solutions in different contexts. This applies as much to the networks used to provide content and instruction as it does to the devices used to access that content.
- **Supporting the design of a relevant curriculum** The curriculum must be appropriate for the learning needs of children and adults in a world that is becoming increasingly dominated by digital technologies, but governments must at the same time also recognise the potential that these new technologies have for enhancing the effective delivery of a national curriculum. In particular, it is essential that any legislated education policy and curriculum is explicitly designed to be relevant for the needs of a country as a whole, and should especially serve the interests of the poorest and most marginalised.
- **Ensuring that content is relevant and appropriate** Governments must have in place national strategies for the delivery of high quality, localised and above all relevant digital content that can enable teacher-facilitators and learners to access materials in support of the curriculum. In contexts where digital technologies are unlikely to be able to be used in the short- to medium-term, it is also incumbent on governments to have in place alternative mechanisms, often paper-based, for children to access content. Governments should always consider the benefits of making all publicly funded content available freely, especially as Open Content through Creative Commons licences.

Ensuring appropriate pedagogies: the practices of teaching and learning

One of the overwhelming outcomes of the COVID-19 pandemic has been the realisation that teachers really do matter. This has presented a good opportunity for education systems to be recrafted so that they place excellence in teaching at their heart. To achieve this, the highest priority must be placed on relevant in-service and pre-service teacher training that focuses on enabling teachers and learning facilitators of all kinds to use digital technologies to enhance their own learning and thereby

improve the quality of their teaching so that all of their pupils and students have better learning outcomes.

- **Empowering teachers, trainers and facilitators** The single most important thing that governments can do is to ensure that teachers, trainers, and learning facilitators are appropriately and rigorously trained in the effective use of digital technologies. This is not just about teaching them "Office" or "digital" skills, but rather ensuring that they all have the ability to use a diversity of technologies to support learners in their varying needs.
- **Ensuring that appropriate pedagogies are in place** The explosion of information available online over the last decade, has meant that it is impossible for teachers any longer to be seen as the sources of all knowledge. Changing theories and practices of teaching are closely related to such externalities, and it is therefore essential for governments to ensure that the pedagogies in use in their countries are fit for purpose. This will often mean the replacement of traditional didactic modes with more constructivist, or constructionist pedagogies.
- **Using relevant assessments** Teaching and assessment go hand in hand; it is important to have appropriate mechanisms in place so that learners and employers can have a shared understanding of the skills and competencies that students have acquired. Digital technologies offer many strengths and opportunities for enhanced formative and summative assessments, and these should feature highly in government educational agendas. Nevertheless, governments must also ensure that these assessments are indeed relevant to their countries' needs.

Making wise use of technology: security, privacy and data

COVID-19 has illustrated very clearly how increased levels of digital connectivity and use during the pandemic have translated into increases in harms. It has also highlighted difficult issues surrounding privacy and the use, or abuse, of personal data. Governments must therefore ensure that the potential harms of using digital technologies in education and learning are mitigated, so that their benefits can be safely and fully achieved, especially by the most vulnerable.

- **Ensuring the safety of everyone involved in education and learning** Governments must place the highest priority on the safe use (in the broadest sense including harmful content, health-related issues and data loss) of digital technologies as an integral part of all learning and training programmes for children and adults alike. This requires comprehensive legislation, enforcement of that legislation, and widespread training and support for learners and teachers alike.
- **Making systems secure** It is essential to protect individual data and prevent education digital system disruption. Governments should therefore ensure that clear guidance is given to heads and administrators throughout the system, from Ministries to schools and community learning centres, and that breaches are treated with the utmost seriousness.

- **Caring about privacy and data** Governments should create mechanisms for citizens to have open and sustained discussion with them about digital privacy in general, and also specifically within the educational context. The marginalised are already by definition less fortunate than are most others within any society, and the dangers of any further loss of privacy for them are likely to marginalise and harm them even further. In general, governments should tend towards the precautionary principle in managing educational data.

Financing the use of digital technologies within public education systems to serve the poorest and most marginalised

The Report concludes with an overview of ways through which funding can be made available in support of learning initiatives that make use of digital technologies. This emphasises in particular the importance of ensuring a cross-government approach to the funding of digital infrastructure. As already highlighted, Ministries of Education should not, for example, be required to cover the costs of providing connectivity and electricity to all learning establishments, but instead this should be undertaken through a holistic cross-government programme for delivering comprehensive services to communities.

Eight basic recommendations that governments should adopt in funding are highlighted:

- Funding should be based on the principle of equity, so that additional funding is made available to those most in need;
- Holistic cross-government approaches are essential;
- The state has the main responsibility for funding public education, but when used effectively and appropriately donors, the private sector, households and civil society can also contribute funding;
- All funding models must be based on the lifetime total cost of ownership of an initiative and include both CAPEX and OPEX;
- Multi-sector partnerships can offer significant benefits, but only if undertaken appropriately and effectively;
- Initiatives should be designed at scale, even if they are only started with pilot projects; nothing will “go to scale” unless it is “designed at scale”;
- All government policies relating to the use of digital technologies in education should be based on the principle of technology neutrality;
- In general, public sector education should be free to end-user; this is especially so for the poorest and most marginalised.

In conclusion

There is no one-size-fits-all way in which governments should promote and implement initiatives that use digital technologies to improve the learning outcomes of the most marginalised, and governments always need to take into consideration their local contexts and priorities. However, in very general terms, the following order of initial priorities and actions is often appropriate:

1. Creating a **long-term cross-party vision** for ensuring that digital technologies are used to enhance learning by the poorest and most marginalised

2. Establishing an **integrated and holistic cross-government team** to deliver that vision

3. Beginning by ensuring that all **teacher training colleges have as high-quality digital infrastructures as affordable**, and that pre-service and in-service training programmes are implemented to ensure that teachers are trained in appropriate and relevant pedagogies.

4. Prioritising the **specific educational challenges for which digital technologies can have the most significant impact** for the most marginalised in your country (this could, for example, be high numbers of refugees, very dispersed island communities, or numerous minority ethnic groups for whom learning content in the main language is inappropriate).

5. Identifying and **implementing technology-relevant** (in terms of what is both feasible and affordable) **approaches** to resolve these challenges, remembering that low-tech options (such as radio or TV) and Open Educational Resources can often deliver very cost-effective and resilient options, and that multi-sector **partnerships** with the private sector and civil society can be valuable in ensuring appropriateness and sustainability.

6. At all times ensuring that **security, safety and privacy** receive the highest priority in using digital technology for delivering education and training, especially for children and vulnerable adults

As emphasised throughout this Report, the precise order in which the more detailed recommendations are implemented will depend heavily on the character of the existing educational systems, the political will, the levels of funding available, the extent of infrastructural provision (such as school buildings, libraries, electricity, and Internet connectivity), and the geographical size and complexity of the country.

Two basic principles about what not to do also often seem to be forgotten, and should always be remembered:

- Don't put digital technologies into schools without sufficient teachers first being trained in how to use them effectively to enhance learning outcomes;

  and

- Pilot projects using digital technologies for education should not be done where they are easiest to do and are most likely to succeed, but instead with and amongst the poorest and most marginalised, where the circumstances are most challenging, and where most innovation and creativity is required to make them succeed.

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Guidance for governments on the use of digital technologies in education

Act Two: Report

Tim Unwin
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[ACT Three: Guidance Notes]

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1. Reading the Report

This Report provides clear and concise advice for senior government officials about how they can most effectively and appropriately promote the use of digital technologies in their own specific contexts to deliver enhanced education[1] systems that will improve the quantity and quality of learning for all of their citizens once the immediate challenges of COVID-19[2] have been mitigated. It focuses especially on how the needs of the poorest and most marginalised can be met, arguing that to do so governments must adopt cross-government holistic approaches to education that deliver resilient system-wide interventions (for a wider discussion of meanings of marginalisation see Section 7).[3] This applies especially, but not only, to the funding of national infrastructure initiatives, which should never be left to the education sector alone. The Report is also of wider importance for readers in international agencies, other organisations and all sectors, particularly because it argues that the private sector and civil society both have important parts to play in delivering such education systems, and it suggests ways through which this can most effectively be achieved.

Written in 2020, the Report sees COVID-19 and the lessons learnt from its impact on education systems, as providing a rare opportunity to rethink holistically and systemically how digital technologies should be used to create resilient educational systems. More widely, it draws both on existing good practices and also on innovative responses to the pandemic. It is driven fundamentally by a commitment to equity and inclusion within education systems, and consciously builds on the foundations of existing international agreements such as the Incheon Declaration of 2015.[4]

The Executive Summary (Act One[5]) has provided a broad overview of the Report's recommendations. It concluded with two basic principles that should always be remembered:

[1] The Report adopts a broad definition of education, focusing primarily on public sector primary and secondary education, but also including technical and vocational, tertiary (college and university, post-secondary), lifelong (throughout the life cycle), lifewide (involving real contexts and settings), and informal learning.

[2] We use COVID-19 (as the name of the disease) throughout this report, whilst recognising that it is caused by the coronavirus SARS-CoV-2. See WHO's summary of naming at https://www.who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance/naming-the-coronavirus-disease-(COVID-2019)-and-the-virus-that-causes-it.

[3] This agenda is closely aligned with some of the arguments within the UN Policy Brief released in August 2020 on *Education during COVID-19 and beyond* (https://www.un.org/sites/un2.un.org/files/sg_policy_brief_covid-19_and_education_august_2020.pdf) especially relating to equity, to the importance of financing and to the potential of digital technologies. However, the recommendations contained within this Report, are more far reaching, and provide much more specific practical suggestions for governments to adopt in delivering those principles.

[4] UNESCO (2015) *Incheon Declaration and Framework for Action*, Paris: UNESCO, https://iite.unesco.org/publications/education-2030-incheon-declaration-framework-action-towards-inclusive-equitable-quality-education-lifelong-learning/

[5] The word "Act" (deriving from Latin *Actus*, meaning an event or something done) for each of these main documents has been chosen specifically as a reminder that we must all take ***act***ion if the poorest and most marginalised are indeed to benefit from the use of digital technologies in education and learning. It is of course also a reminder that it must now be performed for it to come into effect, as in a theatrical play, on the world stage.

- Don't put digital technologies into schools without sufficient teachers first being trained in how to use them effectively to enhance learning outcomes;

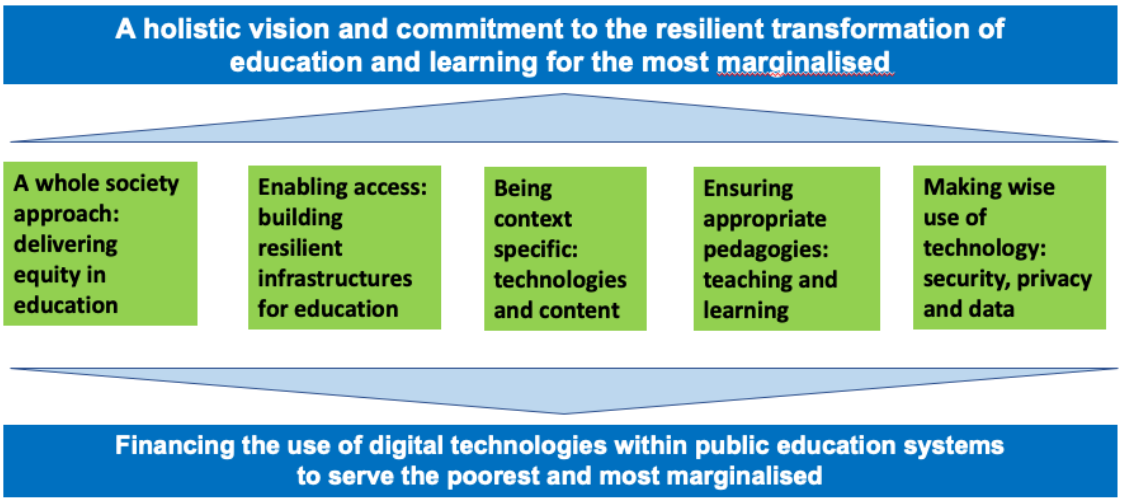
  and

- Pilot projects using digital technologies for education should not be done where they are easiest to do and are most likely to succeed, but instead with and amongst the poorest and most marginalised, where the circumstances are most challenging, and where most innovation and creativity is required to make them succeed.

Act Two now sets out the broader context to these issues, and fleshes out the recommendations in more detail. It is divided into three main sections: Part I summarises the context within which digital technologies can be used to deliver appropriate educational goals, focusing especially, but not exclusively, on the needs of poor and marginalised people living in low- and middle-income countries in a post-COVID-19 world;[6] Part II then focuses on the five main thematic and system-wide issues that governments need to address; and Part III addresses the financing of the recommendation, and the next steps that governments can take to deliver more effective education systems. Act Three then provides 14 Guidance Notes that lay out clearly and succinctly how some of the most important of these steps can be taken. The Report was explicitly developed through a novel and comprehensive system of consultations and consensus building involving 87 people (43 women and 44 men) from different stakeholder groups across 34 countries (see Annex 1 for details). This has provided robust evidence upon which the recommendations have been based.

In summary, the diagram below describes the framework for Part II. This begins in Section 8 by reiterating the case for a holistic vision and commitment (shown in the top blue box). Without this, no government will be able effectively to deliver a resilient education system that will transform learning for the most marginalised. The five green boxes summarise the five main interventions that governments need to implement (Sections 9-13). Section 14 then addresses ways through which these can most appropriately be financed (shown in the lower blue box).

[6] The term post-COVID-19 is itself problematic. It is used here to refer to the world in which we are now living after the initial impact of COVID-19, and we fully recognise that the virus SARS-CoV-2 that caused the pandemic is likely to be with us for the foreseeable future. How the world's governments and peoples will manage this still remains very uncertain, but one of the purposes of this Report is to ensure that governments use digital technologies to deliver education systems that remain as resilient as possible to future externalities.



In interpreting this diagram, it is important to emphasise that all of the five sets of recommendations featured in green are important, and that the precise ways and order in which they are implemented are likely to vary in different contexts. In practice, most of them are likely to be developed at various rates in parallel, and a core role of those charged with implementation will be to ensure that there is indeed effective coordination between each set of recommendations. Annex 2 offers a diagrammatic representation of which Ministries and Regulators need to be involved in overseeing or implementing each of these broad sets of recommendations.

Throughout, this Report adopts an approach that begins with the intended educational outcomes, and only then seeks to explore how digital technologies can serve to help deliver effective and appropriate learning for all.

PART I: Context

2. COVID-19, education and digital technologies

COVID-19 has dramatically affected the lives of people across the world, not only in terms of health and mortality, but also in the impact that it has had on education systems and national economies more broadly as governments have embarked on differing ways through which to respond to the pandemic. At the time of writing,[7] it is evident that most, if not all, of the countries of the world have been seriously affected by COVID-19, both directly and indirectly. The experiences of India with 7,365,509 reported cases and 112,146 deaths, Brazil with 5,170,996 reported cases and 152,513 deaths, and South Africa with 698,184 reported cases and 18,370 deaths so far (as at 15th October 2020)[8] indicates that the pandemic has had a direct impact in terms of mortality in every continent, and that the early experiences of China, Europe and North America have now been replicated across many low- and middle-income countries.[9]

The *indirect* effects of COVID-19 on education are likely to be much greater than are the *direct* effects.[10] There is much that is still not known about COVID-19, but evidence to date suggests that younger people are less likely to have adverse health effects from it than are older people, and thus while some learners and teachers will undoubtedly die, the majority will not be seriously ill as a direct result of COVID-19.[11] The closure of schools for several months in 2020 may also not have significant lasting impacts, even for those whose schooling was interrupted for several months (see Section 4). The indirect effects, though, such as the disruption to food supply

[7] Data on 15th October, 2020. We recognise that all such data are unreliable, and depend on globally differing reporting mechanisms and policies.

[8] https://coronavirus.thebaselab.com/, 15th October 2020.

[9] See Walker, PGT, Whittaker, C., Watson , O. *et al*. (2020) The Global Impact of COVID-19 and Strategies for Mitigation and Suppression. WHO Collaborating Centre for Infectious Disease Modelling, MRC Centre for Global Infectious Disease Analysis, Abdul Latif Jameel Institute for Disease and Emergency Analytics, Imperial College London; Mellan, T.A., Hoeltgebaum, H.H., Mishra, S. *et al*. (2020) Estimating COVID-19 cases and reproduction number in Brazil, Imperial College London, doi: https://doi.org/10.25561/78872; and CMMID LSHTM (2020) National and Subnational estimates, https://epiforecasts.io/covid/reports.html#Africa. For a more positive view about the likely impact in East Africa, see Mold, A. (2020) Risk and resilience: how East Africa could bounce back from the COVID-19 Pandemic, *OECD Development Matters*, https://oecd-development-matters.org/2020/06/02/risk-and-resilience-how-east-africa-could-bounce-back-from-the-COVID-19-pandemic

[10] Direct effects include mortality of teachers and learners, as well as the immediate impact on schooling, as with school closures and disruption to examination systems; indirect effects include the wider impact on health systems, the collapse in educational funding, and the effects of the consequent global economic recession.

[11] The Children's Society (2020) *The impact of COVID-19 on children and young people*, London: The Children's Society; Hogan, A.B., Jewell, B. Sherrard-Smith, E. *et al.* (2020) The Potential Impact of the COVID-19 Epidemic on HIV, TB and Malaria in Low-and Middle-Income Countries. Imperial College London, doi: https://doi.org/10.25561/78670; Robertson, T. *et al*. (2020) Early estimates of the indirect effects of the COVID-19 pandemic on maternal and child mortality in low-income and middle-income countries: a modelling study, *The Lancet*, https://doi.org/10.1016/S2214-109X(20)30229-1; and Dowd, J,B. *et al.* (2020) Demographic science aids in understanding the spread and fatality rates of COVID-19, *medRxic,* doi: https://doi.org/10.1101/2020.03.15.20036293

systems, the decline in government revenues that can be spent on education, and the disruption to health systems are all much more likely to cause serious systemic challenges for education, as well physical and mental health problems for young people, and those out of work or seeking re-training. Predictions thus suggest that there are likely to be serious increases in the numbers of people dying from other diseases such as measles and malaria as a result of these disruptions,[12] and the resurgence of Ebola in the Democratic Republic of Congo likewise gives rise to serious concern.[13] Small-Island Developing States (SIDS) that implement effective visitor quarantine regimes, as for example has been achieved in New Zealand, may not suffer as much directly as their larger continental neighbours, although the changed global economy, and fundamentally altered systems of communication and interaction, promoted by responses to COVID-19 will continue to have serious indirect effects on them, particularly through the disruption of trade.

A fundamental point that must be also be emphasised right at the beginning of this Report is that those already in school are usually not the most marginalised. The lack of formal learning experiences for out-of-school children before COVID-19 (see Table 1) have thus been little different during the pandemic; those children whose lives are spent on the streets, or girls who never go to school because of the cultural beliefs that dominate in some patriarchal societies, have paradoxically encountered much less disruption to their "learning" than have those who usually go to school. Table 1 also serves as an important reminder of the harsh reality that access to reliable grid electricity and connectivity to the Internet remain very sparse in many parts of the world, and therefore that many of the digital technology "solutions" often advocated for rapidly transforming education system there are not yet feasible or realistic. More importantly, they are likely to continue to be unavailable to the poorest and most marginalised for many years ahead.

Table 1: Electricity, infrastructure and out-of-school youth (latest official data)

	% Primary schools with access to electricity 2018 [1]	Internet usage (% population) 2019 [2]	Out-of-school children of primary school age (millions) 2018 [1]	Out-of-school adolescents of lower-secondary school age (millions) 2018 [1]
World	**68.6**	**53.6**	**59.1**	**61.5**
Arab States	85 [3]	51.6	4.8	3.7
Central and Eastern Europe		(see below)	0.9	0.8
CIS		77.2		
Central Asia	100		0.1	0.3
East Asia and the Pacific	89	(see below)	5.9	9.1
Asia and Pacific		48.4		

[12] WHO (2020) Deaths from Democratic Republic of the Congo measles outbreak top 6000, https://www.afro.who.int/news/deaths-democratic-republic-congo-measles-outbreak-top-6000. Although written in January, this highlights the potential for COVID-19 to exacerbate existing health challenges.

[13] WHO (2020) New Ebola outbreak in northwest Democratic Republic of the Congo; WHO surge team supporting the response, https://www.who.int/news-room/detail/01-06-2020-new-ebola-outbreak-detected-in-northwest-democratic-republic-of-the-congo-who-surge-team-supporting-the-response.

Latin America and the Caribbean	88.3	c.70	22.7	25.4
North America and Western Europe	100 [3]	(see below)	0.4	0.4
The Americas		77.2		
Europe		82.5		
South and West Asia	52.1		12.4	16.5
Sub-Saharan Africa	33.8	(see below)	32.0	28.0
Africa		28.2		
Small Island Developing States			0.4	0.3

Sources and notes:
[1] UIS data http://data.uis.unesco.org/Index.aspx, 7th June 2020
[2] ITU data https://www.itu.int/en/ITU-D/Statistics/Documents/statistics/2019/ITU_Key_2005-2019_ICT_data_with%20LDCs_28Oct2019_Final.xls, 7th June 2020
[3] data for 2017

The disruption caused by COVID-19 is usually considered mainly in terms of it being a considerable global threat that must be "defeated". However, it is also an opportunity from which to learn and from which to craft stronger educational systems that are more resilient to future pandemics or global catastrophes.[14] One of the most prominent characteristics of responses to the COVID-19 pandemic has been how the use of digital technologies[15] has enabled many businesses and social structures to be maintained at a time of social-distancing and spatial isolation. Likewise, digital technologies have been used in a multitude of ways to provide effective learning platforms and digital content for those who have access to them and can afford them.[16] Many such uses of digital technologies, though, have been poorly thought through, and governments, donors and educators have spent significant amounts on implementing novel programmes that have not necessarily been fit for purpose, and may not be appropriate in the longer term. Moreover, use of these technologies has

[14] International Commission on the Futures of Education (2020) *Education in a Post-COVID World: Nine Ideas for Public Action*, Paris: UNESCO; Mitra, S. (2020) Children and the Internet: learning, in the times to come, https://www.cevesm.com/article-children-and-the-internet-2; and UN Policy Brief released in August 2020 on *Education during COVID-19 and beyond*, https://www.un.org/sites/un2.un.org/files/sg_policy_brief_covid-19_and_education_august_2020.pdf.
[15] Digital technologies (formerly mainly known as Information and Communication Technologies, ICTs) are constantly being developed and transformed, and it is therefore extremely difficult to define them in any precise way, especially in the educational context. The term is thus used very broadly in this Report to refer to both hardware (including desktop and laptop computers, tablets, mobile 'phones, radios and TVs) and software (including applications, learning management systems, administrative systems, networks, platforms, content and data analytic systems), while recognising that processes of convergence and miniaturisation are increasingly making even this distinction problematic. See: Unwin, T. (2017) *Reclaiming Information and Communication Technologies for Development*, Oxford: Oxford University Press, pp.35-38; see also Januszewski, A. and Molenda, M. (eds) (2008) *Educational Technology: a Definition with Commentary*, Mahwah, NJ: Lawrence Erlbaum Associates.
[16] These have, though, encountered many challenges, and have received a variety of contrasting commentaries: see Williamson, B., Eynon, R. and Potter, J. (2020) Pandemic politics, pedagogies and practices: digital technologies and distance education during the coronavirus emergency**,** *Learning, Media and Technology*, 45(2):107-114, https://www.tandfonline.com/doi/full/10.1080/17439884.2020.1761641; Li, C. and Lalani, F. (2020) The COVID-19 pandemic has changed education forever. This is how, *World Economic Forum*, https://www.weforum.org/agenda/2020/04/coronavirus-education-global-covid19-online-digital-learning; Crawfurd, L. (2020) Why the COVID crisis in not Edtech's moment in Africa, *Center for Global Development*, https://www.cgdev.org/blog/why-covid-crisis-not-edtechs-moment-africa.

had a dramatic impact on increasing inequalities in learning opportunities at all scales between those who have and are able to use them, and those without such possibilities, because they are too poor or live in isolated areas without reliable electricity and Internet connectivity (see Table 1 and Section 4).[17] Only 33.8% of primary schools in Sub-Saharan Africa have electricity; only 28.2% of people in Africa use the Internet.

This Report provides governments with advice and guidance that not only enables them to use digital technologies wisely to build resilient education systems fit for future purposes, but it also focuses especially on how they can do so by first addressing the learning needs of the poorest and the most marginalised. It is concerned with providing schooling beyond schools, and by focusing first on those who are usually considered to be last of all.

[17] UNESCO (2020) Startling divides in distance learning emerge, https://en.unesco.org/news/startling-digital-divides-distance-learning-emerge

3. The global context of education systems before COVID-19: aspirations to be inclusive, equitable, lifelong, and innovative

Many international organisations, donors, foundations and governments have sought to develop new digital technology solutions that seek to "solve" the immediate problems caused by COVID-19,[18] often without sufficient thought to the impact that these will have on existing policies established through hard-negotiated international agreements to which many national governments are already committed. Many of these existing frameworks include important claims about the kind of education that people want and require, and the ways through which this can be achieved. The disruptions of COVID-19 must not let governments lose sight of these pointers and directions.

COVID-19 has become so dominant in people's lives that by mid-2020 it was already hard to remember what educational policy making was like globally and nationally at the end of 2019. Two key documents developed in the UN context provide helpful summaries of existing consensuses in the latter years of the 2010s. The first is the important *Incheon Declaration for Education 2030* convened in 2015 by UNESCO, UNICEF, the World Bank, UNFPA, UNDP, UN Women and UNHCR in the context of UN Agenda 2030 and Sustainable Development Goal 4.[19] This provides a vision, goals, and implementation modalities that were agreed by participants from 160 countries, including over 120 Ministers, and explicitly focused on ways through which "inclusive and equitable quality education and lifelong learning for all" could be achieved. Sadly, the world has not yet made much progress since then to achieving these three key pillars: being *inclusive*, *equitable*, and *lifelong*.[20]

These ideas were taken forward in 2018 and 2019 by 21 UN agencies working together within the context of the UN High-Level Committee on Programmes (HLCP) to develop a report for the UN Chief Executive's Board on a system-wide strategic approach for achieving inclusive, equitable and innovative education and learning for all, in the context of the UN Secretary General's interest in AI, the future of work, and the education necessary to be fit for purpose in a world rapidly being changed by digital technologies.[21] The proposed recommendations in the education and learning report addressed five main themes:

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[18] See for example the Global Education Coalition (https://en.unesco.org/COVID19/educationresponse/globalcoalition) led by UNESCO and bringing together multilateral partners, private sector companies, large civil society and non-profit organisations, media partners, and networks and associations; the World Bank's briefing and resources on remote learning, digital technologies and COVID-19 https://www.worldbank.org/en/topic/edutech/brief/edtech-COVID-19; and the EdTech Hub's array of newly funded COVID-19 related initiatives (https://edtechhub.org/coronavirus) funded by DFID, the World Bank, and the Bill and Melinda Gates Foundation.

[19] UNESCO (2015) *Incheon Declaration and Framework for Action*, Paris: UNESCO, https://iite.unesco.org/publications/education-2030-incheon-declaration-framework-action-towards-inclusive-equitable-quality-education-lifelong-learning/

[20] See also UNESCO (2020) *Global Education Monitoring Report 2020. Inclusion and Education: All Means All*, Paris: UNESCO, which highlights that much still needs to be done to begin to address real inclusion in education.

[21] UN CEB (2019) Towards a United Nations system-wide strategic approach for achieving inclusive, equitable and innovative education and learning for all,

- "Ensuring equity, empowerment and support for learning by the most marginalized"
- "Ensuring appropriate depth and breadth of relevant skills acquisition and activation"
- "Enabling flexibility and continuous learning throughout the life cycle"
- "Promoting and ensuring appropriate and synergistic use of emerging innovation and technologies"
- "Enhancing effective partnerships, coordination and optimization in financing and resource mobilization"

It also included a powerful statement on the value of policy guidance:

> *"Policy guidance to Member States should convey the important point that education, training and learning need to be treated in a holistic manner across all ministries. This is especially so in the context of lifelong and lifewide learning, as well as their importance for employment. Such policies must recognize that there is no "one-size-fits-all" solution and that the United Nations should be advocating a series of good (rather than best) practices that Governments can draw upon in implementing their own effective context-specific policies and strategies".*[22]

The present Report explicitly builds on this work, by developing a series of Guidance Notes that provide governments with recommendations drawn on research evidence of what works (as well as what doesn't) that they can adapt for their own purposes in delivering education systems that address the requirements of the *Incheon Declaration* and the aspirations of the HLCP's paper on a UN system-wide approach to the future of learning (Act Three). It nevertheless also argues that the value of education should be seen as being much broader than just the employment emphasis highlighted in the above quotation.

In so doing, it is crucial to emphasise that public education systems across the world have long been underfunded, especially when faced with the increased expectations and demands placed upon them both quantitively and qualitatively. Not only is there insufficient funding, but funding is often also poorly applied. This was especially highlighted in the *11th Education For All Global Monitoring Report* (2013/14),[23] which emphasised that the global learning crisis was costing governments US$129 billion a year because of systems that failed to ensure children learn. Things have not improved since then despite efforts by initiatives such as the Global Partnership for Education,[24] and inappropriate uses of digital technologies have

https://www.undocs.org/en/CEB/2019/1/Add.4

[22] UN CEB (2019) Towards a United Nations system-wide strategic approach for achieving inclusive, equitable and innovative education and learning for all, https://www.undocs.org/en/CEB/2019/1/Add.4 p.17. Note that lifelong learning refers to learning throughout the life cycle, and lifewide learning involves real contexts and settings.

[23] UNESCO (2014) *11th Education For All Global Monitoring Report,* https://en.unesco.org/gem-report/report/2014/teaching-and-learning-achieving-quality-all

[24] Global Partnership for Education https://www.globalpartnership.org/; for its COVID-19 response see https://www.globalpartnership.org/gpe-and-COVID-19-pandemic.

often made matters worse by imposing a significant additional burden on public education financing. This Report therefore concludes with important recommendations about the how education should be funded in a post-COVID-19 world (Section 14). Governments have tough choices to make; not only is more funding required, but it must be used wisely to create systems that are fit for purpose. As the much-cited aphorism says, "*If you think education is expensive, try ignorance*".[25]

Education systems are in many quarters increasingly being seen in a utilitarian way, primarily as a means of providing people with the skills necessary to contribute to a particular kind of economy, notably modelled on education systems in the USA and Europe. This Report acknowledges the skills-based emphasis of much current educational thinking, especially that associated with so-called 21st century skills,[26] but recognises that education is much more important than such an emphasis on skills alone might imply. The Report suggests that quality education must include social, cultural and political understandings as well as the technical skills to enable thriving economies. An education system that does not provide its citizens with critical understandings of the past, can only repeat the mistakes of the past, albeit in technically novel ways. Responses to COVID-19 so far, and especially those promoted through the use of digital technologies, all too often seem to be continuing further to entrench deeply flawed systems that largely serve the interests of the richer and more privileged members of society. This Report instead recommends ways through which this can be avoided so that education can indeed become truly empowering, people-centred, and inspiring for all a state's citizens in a post-COVID-19 world.

Above all, this Report begins with the education and not the technology.

[25] This has been attributed to many people including Andy McIntyre and Derek Bok, although similar sentiments have been found in the US dating back to the late 19th century, and Lord Avebury is claimed to have said "ignorance costs more than education" in 1901.
[26] AES Education, https://www.aeseducation.com/blog/what-are-21st-century-skills

4. How is COVID-19 reshaping education?

The dominant global response to education during the COVID-19 pandemic has been a relatively short-term closure of schools in the context of widespread measures taken by most governments to restrict movement of their citizens and impose social distancing measures. UNESCO has thus traced how the numbers of children and countries affected rose from the 999,014 affected learners in China on 16th February 2020, to 1,575,543,640 affected learners in 182 countries by 26th March 2020, representing 90% of all learners.[27] Many of these closures, though, were relatively short-term, with some countries already having opened up schools again after less than two months; only 70% of learners were still affected by 12th May and 40% by 13th August, although they had risen again to 50% by 13th September.[28]

School closures have had a dramatic impact on both the practical and the perceived use of digital technologies for education, but in different ways in varying contexts. In those contexts characterised by good Internet connectivity, reliable electricity, widespread access to devices and digitally experienced teachers, many children have been able to continue to learn effectively. They have clearly shown that online-learning is practicable and feasible at all stages of education from primary through to higher education.[29] The speed with which some more traditional schools and universities have shifted to such online learning modes in response to the need for social distancing, often with the support of the private sector, has been quite remarkable. Global corporations with systems already in place to offer digital learning platforms have also been able to benefit very considerably from this COVID-19 bonanza, and newer ones such as Zoom have gained large global markets.[30]

[27] UNESCO COVID-19 impact on education https://en.unesco.org/COVID19/educationresponse; interesting not least for its apparent precision in numbers, down to the very last learner. See also overview by Mott Macdonald (2020) COVID-19 global education policy responses, https://www.mottmac.com/covid-19-education-policy, and UNICEF (2020) *COVID-19: Are Children Able to Continue Learning During School Closures? A Global Analysis of the Potential Reach of Remote Learning Policies Using Data from 100 Countries*, New York: UNICEF, https://reliefweb.int/sites/reliefweb.int/files/resources/Remote-Learning-Factsheet-English_2020.pdf. For the African context, see EdTech Hub and eLearning Africa (2020) *The Effect of Covid-19 on Education in Africa and its Implications for the Use of Technology*, London: EdTech Hub and eLearning Africa, which notes that 95% of respondents to their survey had commented that all schools in their African countries had been forced to close, https://www.elearning-africa.com/ressources/pdfs/surveys/The_effect_of_Covid-19_on_Education_in_Africa.pdf.

[28] See https://en.unesco.org/COVID19/educationresponse. See also useful summary by the World Bank (2020) Education systems' response to COVID-19, Brief: July 12th, 2020, http://pubdocs.worldbank.org/en/673321594645490476/Education-Sector-Brief-July-12th.pdf.

[29] See UNESCO's list of national responses of learning platforms and tools across the world, https://en.unesco.org/covid19/educationresponse/nationalresponses

[30] One of the companies to gain most from the crisis has thus been Microsoft, which has repositioned its Teams Hub as an educational environment, even though it was originally designed primarily for business purposes. Their partnership with UNICEF (and originally with Cambridge University) to expand the Learning Passport as a global learning platform has also enabled them to benefit swiftly from this market opportunity. See also Microsoft (2020) Responding to COVID-19 together https://news.microsoft.com/COVID-19-response/; Warren, T. (2017) How Microsoft built its Slack computer, *The Verge*, https://www.theverge.com/2017/3/14/14920892/microsoft-teams-interview-behind-the-scenes-slack-competition; and Microsoft (2020) UNICEF and `Microsoft launch global learning platform to help address COVID-19 education crisis, https://news.microsoft.com/2020/04/19/unicef-and-microsoft-launch-global-learning-platform-to-help-address-COVID-19-education-crisis/

However, in less-well-resourced contexts, perceptions of the potential of digital technologies, especially through online learning have also been raised significantly. Real questions arise, though, in these contexts about how best to implement such educational transformations and how best to fund them. This Report is specifically designed to help governments answer these questions.

Many companies (both start-ups and established non-profits), as well as civil society organisations, have sought to take financial advantage of this opportunity to deliver learning out-of-school in the economically poorer countries of the world, and have been eager to take the funding offered by numerous international organisations, foundations and bilateral donors eager to "solve" this perceived need. However, as noted above, schools in some countries were already re-opening in May and June 2020, and many such novel initiatives are unlikely to be implemented before the problem they were claiming to solve has largely disappeared. A reckoning will need to be held at some time to evaluate just how much funding has been wasted in failed attempts to develop digital technologies for education in inappropriate contexts during the COVID-19 pandemic. It must also be emphasised that, while such initiatives are possible in richer countries with good Internet connectivity, they presently remain impossible in many other parts of the world, and especially in much of Africa, where connectivity is often poor and unreliable, notably for rural schools (see Table 1).

The main issue that arises for governments is to ascertain how many and which of these new digital technologies can, or should, be used in what ways to deliver education for the poorest and most marginalised in the future.

COVID-19 has also had clear negative effects on learning and education that go well beyond merely the closure of schools and a shift to digital learning systems. In summary, six main groups of challenging impacts can be noted:

1. *Reinforcing learning inequalities*. One of the greatest impacts of COVID-19 on learning and education has been its effect on exaggerating the inequalities caused by digital technologies at all scales. Put simply, those who have access to Internet connectivity and the learning resources available through it are usually readily able to continue to engage in learning. However, those without such access at home, or who attend schools that are unable to provide continuity of learning online are becoming even more disadvantaged as a result. This is evident both within all countries, and also between countries in different parts of the world.[31]

2. *Impact on teachers' workloads and welfare.* Digital technologies often increase teacher workloads, particularly when they need to teach multiple classes online, or have to respond to numerous questions from pupils and students out of class time.[32] While this can be managed in large part by good and efficient school systems, all too often these systems and processes are not thought through sufficiently rigorously or put in place.

[31] For a summary in Latin America, see Basto-Aguirre, N., Cewrutti, P. and Nieto-Parra, S. (2020) Is COVID-19 widening educational gaps in Latin America? Three lessons for urgent policy action, *OECD Development Matters*, https://oecd-development-matters.org/2020/06/04/is-covid-19-widening-educational-gaps-in-latin-america-three-lessons-for-urgent-policy-action/#more-12453.

[32] See, for example, EIS (2020) Overwhelming survey response from teachers confirms Coronavirus impact on education, https://www.eis.org.uk/Latest-News/2020survey.

Furthermore, teacher stress has increased significantly in both economically richer and poorer countries, not least as a result of having to learn to use new digital systems and access resources with insufficient training being provided for them on how to do this.

3. *Increasing concerns about social and emotional well-being of learners*. There is now considerable evidence that children's emotional well-being, especially in the learning context, has suffered considerably during COVID-19.[33] Two main issues have arisen: isolation and abuse at home. The value of schools in bringing children together socially has become much more recognised as a result of COVID-19, and their role in protecting children from abusive relationships at home as well as in supporting their nutrition and wider social experiences has also been re-emphasised.

4. *Increasing disconnection with other forms of social and healthcare support*. Families disconnected from the ability to learn at home are also often those who are generally disconnected from wider systems of healthcare and social support. This reinforces downward spirals of deprivation. The tendency in many countries for support to be provided in silos means that the root causes of problems are often insufficiently resolved. Providing children from deprived backgrounds with devices for homework is insufficient by itself. Holistic systems that enable poor and marginalised families to benefit from access to digital connectivity in general and the benefits it can bring is an essential part of any solution.

5. *Changing expectations of parents and the role of families.* Covid-19 has led to a fundamental shift in conceptualisation of the roles of parents and families in the provision of learning.[34] In countries where schools have been shut, many parents and grandparents have rediscovered their role in helping their children to gain the education that they are seen as requiring. This has unfortunately often also highlighted the low formal educational attainments and skills of many parents, especially in the most marginalised contexts. However, it has also provided an opportunity for parents and other adults who might otherwise not have turned to digital technologies themselves for upskilling to realise the opportunities that now exist for lifelong and lifewide learning through their use.[35] As well as presenting parents with challenges, Covid-19 has thus also suggested potential

[33] See, for example, European Civil Society for Education Lifelong Learning Platform (2020) COVID-19 Statement, http://lllplatform.eu/lll/wp-content/uploads/2020/04/LLLP-Statement-COVID-19.pdf; New Jersey Governor (2020) Supporting the emotional well-being of students, https://www.nj.gov/education/COVID19/studentsfamilies/wellness.shtml; UNICEF(2020) Emotional well-being in the time of COVID-19, https://www.unicef.org/northmacedonia/emotional-wellbeing-time-COVID-19.

[34] See, for example, the work on learning families by the UNESCO Institute for Lifelong Learning, https://uil.unesco.org/literacy/learning-families.

[35] See, for example, OECD (2020) The potential of online learning for adults: early lessons from the COVID-19 crisis, https://www.oecd.org/coronavirus/policy-responses/the-potential-of-online-learning-for-adults-early-lessons-from-the-covid-19-crisis-ee040002/; and Livingstone, S. and Blum-Ross, A. (2020) *Parenting for a Digital Future: How Hopes and Fears About Technology Shape Children's Lives*, Oxford: OUP.

benefits for parents in undertaking their own digital learning, and using it to improve their acquisition of new skills required for employment.

6. *Changing balance of educational provision between states and companies*. The privatisation of global education is an increasingly contentious topic.[36] However, regardless of who actually delivers the education on the ground, it is already evident that Covid-19 has provided a major boost to the engagement of the private sector in delivering infrastructure and content for education systems across the world. The balance of educational roles and power has shifted away from states and towards companies, as the latter continue to pursue the market opportunity of education, with the global online education market alone predicted to be worth at least US$319 billion by 2025.[37] The future role of states and public education systems is therefore addressed specifically in Section 6 of this Report.

This Report provides explicit guidance for governments on how to manage successfully many of these challenges, both within its discussion of the main themes and also in more detail in its specific Guidance Notes.

[36] See, for example, Ball, S.J. and Youdell, D. (2007) *Hidden Privatisation in Public Education*, London: Institute of Education, University of London, http://pages.ei-ie.org/quadrennialreport/2007/upload/content_trsl_images/630/Hidden_privatisation-EN.pdf; Global Justice Now and National Education Union (2019) *In Whose Interest? The UK's Role in Privatising Education Around the World*, London: Global Justice Now and National Education Union, https://www.globaljustice.org.uk/sites/default/files/files/news_article/neu1147_for_the_public_good_report_final_0.pdf; for the view from a leading proponent of low-cost private schools see Barber, M, (2013) *The Good News from Pakistan: How a Revolutionary New Approach to Education Reform in Punjab Shows the Way Forward for Pakistan and Development Air Everywhere,* https://assets.website-files.com/59ca37d5fcfbf3000197aab3/5be1df67f395d780786441d8_Pakistan%20final.pdf; for criticisms of Bridge International's work in Africa see Action Contre la Pauvreté *et al*. (2017) Civil society call on investors to cease support to Bridge International Academies, http://globalinitiative-escr.org/wp-content/uploads/2017/07/Civil-society-call-on-investors-to-cease-support-to-Bridge-International-Academies.pdf

[37] Research and Markets (2020) *Global Online Education Market – Forecasts from 2020 to 2025*, Dublin: Research and Markets https://www.researchandmarkets.com/reports/4986759/global-online-education-market-forecasts-from.

5. The role of digital technologies in education systems

The use of digital technologies in education has expanded increasingly rapidly over the last 20 years, from its emergence primarily out of a long history of open and distance learning dating back to the 19th century, particularly at university level.[38] There have been countless reviews of the field, and almost as many different opinions of its value as there have been authors and organisations.[39] In realisation of the challenges involved in determining what good practices actually exist, the UK's Department for International Development (DFID) and the World Bank therefore created the EdTech Hub in 2019, to strengthen the evidence-base about the use of digital technologies in education, and to identify and share good practices for practitioners in the field.[40] This Report has no intention of duplicating that work, but it is important to stress four overarching principles that draw on the existing literature and underlie the arguments herein related to the crafting of sustainable public education systems in a post-COVID-19 era.

1. *The use of digital technologies in education is part of much wider social and economic transformation*. Digital technologies have become an integral part of the global economic system, and can no longer just be treated as an exogenous factor that can be used to implement development outcomes or educational attainment. New digital technologies are constantly being developed for particular purposes and serving specific underlying interests, which are usually not those of the poorest and most marginalised. Often these are designed implicitly or explicitly to make business and productive processes more "efficient" thereby reducing the need for unreliable and inefficient human labour. Indeed, there are many who see a future where humans and machines become much more integrated in the evolution of cyborgs.[41] There is thus strong pressure from the private sector and many

[38] The University of London was the first university to establish distance learning degrees with its External Programme being launched in 1858. See also Nyiri, J.C. (1997) Open and distance learning in an historical perspective, *European Journal of Education*, 32(4), 347-57; Anderson, B. and Simpson, M. 2012). History and heritage in open, flexible, and distance education, *Journal of Open, Flexible and Distance Learning*, 16(2), 1–10.

[39] In the "development" context, see especially, Unwin, T., Weber, M., Brugha, M. and Hollow, D. (2017) *The future of learning and technology in deprived contexts*, London: Save the Children International, https://resourcecentre.savethechildren.net/sites/default/files/documents/the_future_of_learning_and_technology.pdf; Wagner, D. A. (2018). *Learning as Development: Rethinking International Education in a Changing world*. New York: Routledge; Lubin, I (ed.) (2018) *ICT-Supported Innovations in Small Countries and Developing Regions: Perspectives and Recommendations for International Education*, New York: Springer; ICF Consulting (2015) *Literature Review on the Impact of Digital Technology on Learning and Teaching*, Edinburgh: The Scottish Government, https://dera.ioe.ac.uk/24843/1/00489224.pdf; Carrión-Martínez, J.J., Luque-de la Rosa, A., Fernández-Cerero, J., Montenegro-Rueda, M. (2020) Information and Communications Technologies (ICTs) in education for sustainable development: a bibliographic review, *Sustainability*, *12*, 3288, https://doi.org/10.3390/su12083288.

[40] EdTech Hub https://edtechhub.org

[41] Cyborgs are usually considered to be beings with both organic and biomechatronic parts; see Unwin, T. (2017) *Reclaiming Information and Communication Technologies for Development*, Oxford: Oxford University Press.

UN agencies[42] for education systems to be changed fundamentally to serve these new interests. All too often this has led to calls for a focus primarily on science and technology within educations systems. However, the humanities and social sciences are also essential to ensure that people retain the critical acuity to be able to judge whether such uses of technologies are indeed wise and in the best interests of the majority of a state's citizens. Governments have a crucial role in shaping a relevant balance for their citizens in the kind of education necessary to be able safely to negotiate these social and economic transformations.

2. *One size does not fit all: digital technologies must be used in context specific ways*. There is overwhelming evidence that educational solutions using digital technologies must be relevant to the specific contexts and needs of the people for whom they are intended if they are to be successful. A digital technology solution that is relevant for education in China is unlikely to be appropriate for Saint Kitts and Nevis or the Maldives. This gives rise to an important tension, because companies eager to expand their markets are usually keen to impose uniform platforms and content that can be rolled out to as large a market as possible. Instead, this Report also draws on the evidence that building local capacity in countries to develop their own digital technology contributions for their educational vision, often with the support of international companies, can also have the potential to bring wider benefits for their economic systems.[43] Hence, our Guidance Notes are not meant as "best practices" but rather draw on and share *good practices* that governments can adapt to their varying local contexts. The exemplar infographics and slide decks also provide templates for them to use in their internal discussions and policy formulation.

3. *Digital technologies have relevance throughout the education system and should be applied to them in a holistic manner*. Digital technologies have been used in every area of education and learning, but only rarely have they been developed in an integrated way across a country's entire education system. At the heart of this Report therefore is an emphasis on governments adopting a holistic and systemic approach to using digital technologies in achieving their educational vision.[44] Within such an approach, important areas where digital technologies have been used successfully include:
    - Pedagogy and teaching practice
    - Content provision
    - Skills development
    - Assessment
    - Monitoring and evaluation
    - Administrative systems

[42] See for example the UN Secretary General's strategy on new technologies launched in 2018, https://www.un.org/en/newtechnologies/

[43] See, for example, the Mastercard Foundation's agenda for a Centre for Innovative Teaching and Learning in ICT, https://mastercardfdn.org/all/centre-for-innovative-teaching-and-learning-in-ict.

[44] This is also true beyond the education system, as noted for example in the report by ITU and DIAL (2019) *SDG Digital Investment Framework: a whole-of-government approach to investing in digital technologies to achieve the SDGs*, Geneva: ITU, https://www.itu.int/dms_pub/itu-d/opb/str/D-STR-DIGITAL.02-2019-PDF-E.pdf.

It is also important to note that such a holistic approach should be designed to include all areas of education and learning, including the formal system of pre-school, kindergarten, primary, secondary, tertiary and vocational training, as well as more informal and non-formal approaches to lifelong and lifewide learning.

4. *The overarching emphasis should be on the education not the technology*. The fourth core principle underlying this Report is that all government-led programmes relating to the use of digital technologies in education should be led by the educational vision rather than the technology. As a recent report by UNICEF emphasises, we need to put the learning back into remote learning.[45] Numerous initiatives, often at considerable cost, have in the past been introduced by technology champions who see value in giving every child a laptop, or introducing the latest digital curriculum from another "more advanced" country for its pupils. Indeed, the already very stretched budgets of education ministries are sometimes expected to pay for infrastructure developments that are more appropriately budgeted for within the remit of ministries of telecommunications, ICT, or infrastructure. It must also be emphasised that many schools across the world still do not have basic water and waste facilities, and these need to be part of any comprehensive policy for providing fit-for-purpose education systems.

[45] Alam, A. and Tiwari, P. (2020) Putting the 'learning' back in remote learning: policies to uphold effective continuity of learning through COVID-19, UNICEF Issue Brief, Office of Global Insight and Policy, https://www.unicef.org/globalinsight/reports/putting-learning-back-remote-learning.

6. The role of the state in delivering effective education systems in a post-COVID world

Those championing the neo-liberal political-economic systems that have come to dominate much of the world over the last half-century have argued strongly that the private sector can deliver most government services, including education, more efficiently and at lower cost than can governments themselves. This has led to considerable restructuring of some education systems, in which the role of governments in determining and delivering a curriculum in the interests of the citizens that it governs has diminished significantly.[46] This Report is agnostic concerning the level of private sector involvement in education systems, either through partnerships or as the direct providers of education. Its core focus is on how governments can better fulfil whatever role that has been mandated to them by their citizens and/or ruling classes, and it therefore adheres to the widely accepted position that governments should continue to maintain a key role in shaping and influencing the education systems of their states. In essence, governments are the only element within the governance of a state that should legitimately serve the interests of all of their citizens, including the poorest and the most marginalised; they must therefore own these systems. Put simply, private sector companies go out of business if they provide educational services to families who cannot pay for them, unless some form of external subsidy is provided.

There is widespread acceptance in most countries that public education should continue to be provided by states within a formal setting of schools, colleges and universities, in the hope that as many people as possible can receive a relevant education that provides them with the necessary skills to gain employment and live a fulfilled life. The *Incheon Declaration*, for example, clearly asserts that the fundamental responsibility for successful implementation of its agenda lies with governments.[47] Digital technologies have nevertheless been used to undermine this hegemonic position and have shown over the last 20 years that education can be delivered in many novel and footloose ways that need not be confined to traditional school buildings. COVID-19 has also shown very clearly how education can be delivered at scale without the need for lecture theatres and classrooms.

COVID-19 has also highlighted the very important role that governments play in ensuring the continuity of learning in contexts of crisis. This Report's recommendations are therefore intended also to apply to other kinds of crisis, including physical environmental disasters (such as earthquakes and tsunamis), future pandemics, or even violent conflicts (such as warfare and civil unrest), by focusing

[46] See, for example, Hall, R. and Pulsford, M. (2019) Neoliberalism and primary education: impacts of neoliberal policy on the lived experiences of primary school communities, *Power and Education*, 11(3) https://doi.org/10.1177/1757743819877344; Connell, R (2013) The neoliberal cascade and education: an essay on the market agenda and its consequences, *Critical Studies in Education*, 54(2): 99–112; Wilkins, A., Olmedo, A. (eds) (2019) *Education Governance and Social Theory: Interdisciplinary Approaches to Research*, London: Bloomsbury; and Tessitore, M. (2019) Bridge International Academies: a critical analysis of the privatization of public education in Africa, *Review of Education, Pedagogy, and Cultural Studies*, 41(3): 193-209, https://doi.org/10.1080/10714413.2019.1694359.

[47] UNESCO (2015) *Incheon Declaration and Framework for Action*, Paris: UNESCO, para 12, p.9, https://iite.unesco.org/publications/education-2030-incheon-declaration-framework-action-towards-inclusive-equitable-quality-education-lifelong-learning/

especially on ways through which digital technologies can be used systemically to help ensure resilience within education systems.[48] Governments are also usually responsible for determining the overall parameters within which education is delivered, as well as the balance between general principles and diversity in both content and delivery. The Report seeks to ensure that governments have clear guidance on how digital technologies can be used appropriately to deliver on these requirements.

[48] See also the Commonwealth of Learning's short report for Commonwealth Education Ministers: Kanwar, A. and Daniel, J. (2020) *From Response to Resilience*, Vancouver: Commonwealth of Learning.

7. The first shall be last, and the last first: beginning with the most marginalised

This Report argues that digital technologies are accelerators; they have the potential to be used for positive and negative purposes, and they increase the speed and scale of both.[49] Where societies are dominated by inequality or violence, they will increase these, but they also have the potential to be used to reduce inequalities and increase peace[50] if the will of people and their governments is there.

Digital initiatives that focus only on reaching the "next billion", be that in terms of mobile broadband, or access of schoolchildren to the Internet, will only further increase inequalities, because those without those technologies will be left comparatively even further behind. Educational initiatives that seek to focus on the "low-hanging fruit", such as countries or regions with good infrastructure or a large market, will likewise increase inequality. As the "next billion" become connected they will advance rapidly ahead of the left-behind poorest and most marginalised, while the very rich will advance even more rapidly because they can afford to pay for the latest, and supposedly best, new educational technologies. The "next billion" are those that it is easy for the private sector to reach. The "first billion",[51] the poorest and the most marginalised, who will not normally be reached by the private sector, are those with whom governments, international agencies and donors should work most urgently. This is, for example, what the government of Uruguay sought to do with its Plan Ceibal, which tried to ensure that rural schools had access to electricity and connectivity at the same time as devices were distributed.[52]

For the purposes of this Report we see the following main groups of people, both children and adults, as usually being among the economically poorest and socio-politically most marginalised:

- Out-of-school youth, and children at risk of living and working on the streets;
- Children and adults with disabilities of all kinds (which includes at least 10% of the world's population);
- Girls and women in many patriarchal societies;
- Refugees, displaced persons, and (often) migrants;[53]
- Ethnic minorities and indigenous peoples, in circumstances where they are explicitly disadvantaged;

[49] The potential for digital technologies both to do good and also to harm children is well articulated in UNICEF (2017) *Children in a Digital World: The State of the World's Children 2017*, New York: UNICEF.

[50] In this context, see the work of the ICT4Peace Foundation, https://ict4peace.org

[51] This term is preferred because the use of the word "first" emphasises that these people are of most importance in delivering education for all through digital technologies

[52] Plan Ceibal, https://www.ceibal.edu.uy/es.

[53] Throughout this report we use the word "refugees" for brevity, mainly because of its widespread common usage, rather than in a legal sense. However, in so doing we always imply that this includes any displaced persons (and thus including internally displaced persons). Often, the phrase "people seeking sanctuary" is better, not least since it refers to a process (see Phipps, A. (2019) *Decolonising Multilingualism: Struggles to Decreate*, Bristol and Blue Ridge Summit: Multilingual Matters). We also note that many migrants are not necessarily marginalised, but they are mentioned here since others often are.

- Those living in isolated (usually rural) areas with limited infrastructure;
- Those in informal and irregular employment.

The Report uses the term marginalised[54] to express a specific process whereby the existing structures of a society cause some people within it to be excluded, either deliberately or sub-consciously, from benefitting from the resources and experiences of the majority of citizens. The above groups of people are in most contexts usually those who are excluded from the benefits of both formal education and digital technologies (Table 1; Figure 2). However, it must also be stressed that this list is far from being exhaustive, and the most marginalised are usually also the most "invisible". It is salient to recall that in 2018 there were estimated to be 59.1 m primary age children, and 61.5 m lower secondary aged adolescents out of school (Table 1).

The Report and Guidance Notes are therefore very explicitly intended to help governments achieve the principle of equity in educational delivery in the context of the *Incheon Declaration*'s assertion that:

> *"Inclusion and equity in and through education is the cornerstone of a transformative education agenda, and we therefore commit to addressing all forms of exclusion and marginalization, disparities and inequalities in access, participation and learning outcomes. No education target should be considered met unless met by all. We therefore commit to making the necessary changes in education policies and focusing our efforts on the most disadvantaged."*[55]

[54] See, for example, Mcintosh, T. (2006) Theorising marginality and the processes of marginalisation, *AlterNative: An International Journal of Indigenous Peoples*, 2(1), https://doi.org/10.1177/117718010600200103

[55] UNESCO (2015) *Incheon Declaration and Framework for Action*, Paris: UNESCO, para 7, p.7, https://iite.unesco.org/publications/education-2030-incheon-declaration-framework-action-towards-inclusive-equitable-quality-education-lifelong-learning/

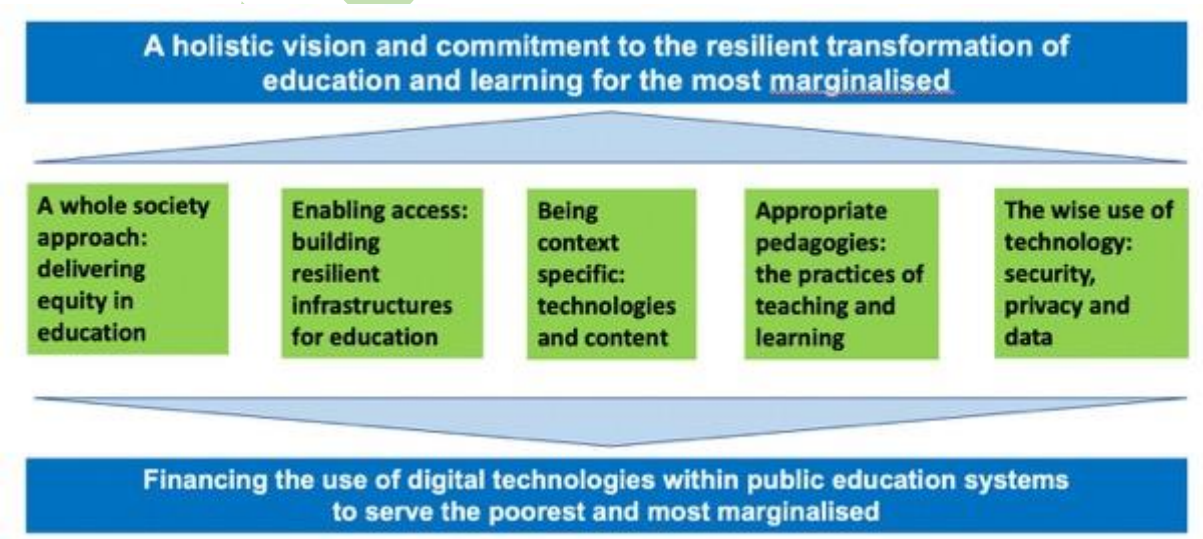
PART II: Core areas where governments should take action to build resilient education systems that enable *all* of their citizens to learn effectively through the use of digital technologies

Part II of this Report builds on the context presented in Part I, and combines this with the advice provided through our consultation process (Annex 1),[56] together with our own experiences, and a review of the latest research findings, to recommend the most important actions that senior government officials should undertake to ensure that digital technologies are used appropriately to create resilient education systems that enable every citizen to learn appropriately and effectively throughout their lives.

Section 8 introduces Part II by emphasising the importance of governments having an overall vision, holistic policies and implementable strategies in place, and then Sections 9-13 of the Report address each of the five most important recommendations for action in turn:

1. **A whole society approach: delivering equity in education**
2. **Enabling access: building resilient infrastructures for education**
3. **Being context specific: technologies and content**
4. **Ensuring appropriate pedagogies: the practices of teaching and learning**
5. **Making wise use of technology: security, privacy and data**

These are shown in green in the diagrammatic representation below of the structure of this part of the Report.



[56] A total of 87 people (43 women and 44 men) from 34 countries contributed to the consultations and interviews. See Annex 1 for a summary of the methodology.

There is a clear intended logic running through these five core themes. First, it is essential that as many parts of society as possible are signed up to the vision of delivering equity in education systems. Then, there has to be the appropriate infrastructure in place so that all learners can benefit, instead of digital technologies being used to increase inequalities and marginalisation. Third, the technologies and content available must be relevant to the contexts in which they are intended to be used. This applies especially in the most marginalised contexts. Fourth, it is essential for teachers and facilitators to be trained effectively in the appropriate use of these technologies, and how they can be integrated into relevant pedagogies. Finally, the potential harms associated with the use of digital technologies must be mitigated, so that all learners can use them safely and securely. Annex 2 provides a succinct bullet point summary of all of the main action points recommended within each section so that government officials have a ready checklist to hand.

This Part of the Report provides further insight and advice over and above that contained in the Executive Summary (Act One). There, the recommendations were reduced in number to just the three most important in each section so as to make it easier and quicker to grasp the essentials of the Report. Here there are approximately twice as many recommendations, providing added detail and advice for governments. All of these recommendations build on existing good practices and the consultation processes undertaken for the Report (Annex 1), but they also draw on specific insights gained over the last six months as governments across the world have grappled with the new challenges caused by having to respond to the COVID-19 pandemic. They therefore particularly emphasise issues that may not have received sufficient attention or emphasis previously, and will become increasingly important in the years ahead as governments seek to maximise the positive potential of the use of digital technologies in creating resilient education systems that serve the interests of all of their people. They are not only relevant for governments responding to COVID-19 and future pandemics, but many of the recommendations also apply in the context of environmental crises, and ongoing processes of marginalisation.

Each recommendation is outlined succinctly in the sections that follow, but to make them more practical and usable, they are also supported by:

- 14 Guidance Notes on key themes, with clear boxes and advice that can be developed in posters or other formats (Act Three);
- A summary of all of the main issues in bullet-point format (Annex 2);
- Recommendations concerning the different ministries that need to be involved in each of the themes (Annex 3);
- Examples of infographics that can be used to support the main arguments (Annex 4);
- Comprehensive footnotes that provide links to the examples cited and further reading;
- Suggestions of ways through which the recommendations can be funded (Section 14); and
- Recommendations in the conclusion (Section 15) concerning the most important initial priorities that should be addressed.

8. Beginning with a holistic vision and commitment to the resilient transformation of education and learning for the most marginalised

It is essential for government leaders to begin with a clear vision for how they wish to transform education in the interests of all of the people living in the states that they govern. One of the main lessons from responses to the outbreak of COVID-19 is that education systems across the world were unprepared for the changes that would be necessary to shift rapidly from a physical schools-based infrastructure to a widely dispersed online system of learning. To their credit, many education systems and schools, especially but not exclusively in the richer countries of the world, were able to do this remarkably quickly, and in a matter of months millions of children were able to continue their learning in some form or another. This was only possible through the existence of broadband infrastructure, innovative pedagogy, existing digital content, and the commitment and dedication of teachers and learning facilitators. However, by the time young people and teachers had adapted, many were then sent back to school, and those who had never been in school have noticed little of difference in their learning opportunities throughout the pandemic. Nevertheless, there will be future pandemics, natural disasters, conflicts and other disruptions to education systems, and our shared experiences of COVID-19 have highlighted both the positive and negative impacts of digital learning for people of all ages. It is essential that all governments have in place a regularly revised education continuity plan, so that they are not caught unprepared by future such crises. This introductory section of Part II therefore highlights the most important things that governments should have in place to ensure resilience, before addressing practical actions that can be used to implement the use of digital technologies appropriately and beneficially within their education systems.

It is essential for government leaders to begin crafting resilient new education systems by addressing five fundamentally linked elements:

1. Vision and commitment
2. Leadership and continuity
3. A holistic cross-government approach
4. Involving all parts of society
5. Clear policies and strategies

None of these are easy, but without them the use of digital technologies within an education system is at best likely to be more challenging, and at worst will be an expensive failure that does not deliver on the learning needs of the poorest and most marginalised.

8.1 Vision and commitment

Government leaders must have a profound vision and commitment to the importance of a resilient public education system that serves the interests of every citizen and

inhabitant of a country throughout their lives.[57] Without such a genuine vision, public education systems will continue to perpetuate social, economic, cultural and political inequalities. Despite global commitments to inclusive education systems, and the adoption of the Incheon Declaration Principles by representatives from 160 countries in 2015,[58] few countries have yet made serious inroads into this agenda. The aftermath of COVID-19 provides an excellent opportunity for governments to lead their societies forward with a substantive commitment to new educational agendas for all of their people. This needs to include effective strategies for ensuring the continuity of education so that the system remains resilient in the face of future crises. There is, though, no single vision for education. Each government needs to develop a vision that best suits the needs in their own contexts, drawing on relevant examples and good practices from elsewhere.

The economic arguments for public education remain strong, and a large body of literature has for a long time indicated that investing in public education is one of the best returns on investment that a government can make.[59] However, education is about much more than just an economic return, and COVID-19 has re-awoken an appreciation that quality education is also essential for ensuring the positive development of shared social and cultural values; it shapes an understanding of the need for shared responsibilities and obligations that enable human rights to be maintained and promoted, and for people to live peaceful and fulfilled lives.

To this end, there must be a vision and commitment towards equity and inclusion.[60] It costs relatively more to provide education for the most marginalised, but that expenditure is indeed a worthy responsibility of governments as they seek to ensure a productive economy and responsible society.[61] The oft-cited examples of South Korea and Singapore,[62] reinforce the logic that the provision of good public education is a crucial factor in building a successful economy and society. It is no coincidence that these countries have also been more successful than most in managing education delivery and human safety through the COVID-19 pandemic. However, such a vision must start with a profound commitment by governments to begin by using technology to reach the unreached, and to ensure that the most marginalised are considered first in any proposed roll-out of digital technologies.

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[57] For an overview of how governments can shift from response to resilience, see Kanwar, A. and Daniels, J. (2020) *Report to Commonwealth Education Ministers: From Response to Resilience*, Vancouver: Commonwealth of Learning, http://oasis.col.org/bitstream/handle/11599/3592/2020_Kanwar_Report_to_Commonwealth_Education_Ministers__.pdf?sequence=5&isAllowed=y.

[58] UNESCO (2015) *Incheon Declaration and Framework for Action*, Paris: UNESCO, para 12, p.9, https://iite.unesco.org/publications/education-2030-incheon-declaration-framework-action-towards-inclusive-equitable-quality-education-lifelong-learning/

[59] See, for example, Phillips, J.J. (1998) The Return-on-Investment (ROI) process: issues and trends, *Educational Technology*, 38(4): 7-14; Frank, S. and Hovey, D. (2014) Return on investment in Education: a "system-strategy" approach, Watertown, MA: Education Resource Strategies https://www.erstrategies.org/cms/files/2466-return-on-investment-in-education.pdf.

[60] UNESCO (2020) *Global Education Monitoring Report 2020. Inclusion and Education: All Means All*, Paris: UNESCO.

[61] See, for example, the case of Uruguay: Bucheli, M., Lustig, N., Rossi, M. and Amabile, G. (2014) Social spending, taxed, and income redistribution in Uruguay, *Public Finance Review, 42(3) 413-33.*

[62] Csizmazia, R.A. (2017) Comparison of economic and education development in Singapore and South Korea, *International Journal of Academic Research in Business and Social Science*, 7(11) http://dx.doi.org/10.6007/IJARBSS/v7-i11/3488.

8.2 Leadership and continuity

Strong and charismatic personal leadership is usually necessary for the achievement of an educational vision committed to equity and inclusion. This depends not only on the President or Prime Minister of a country, but also on the appointment of an appropriately influential and senior Minister of Education. All too often, these educational appointments tend to be of lower priority and seniority than Finance Ministers, Foreign Ministers, or Defence Ministers. If education is to be given the priority it deserves, it is essential for highly able and well-respected people to be appointed to these positions. It is also important that such leaders engage actively in mobilising, motivating, organising, and focusing the attention of all they work with on a clear educational vision for the future that is committed to using digital technologies equitably to deliver learning for everyone, and especially the poorest and most marginalised. This is especially important following the COVID-19 pandemic, when leaders have needed to embrace uncertainty and be flexible and capable of responding swiftly to change.[63]

It is also crucial for long-term, but flexible, policies to be put in place so as to ensure continuity of delivery. Unlike vaccinations which can be used swiftly to inoculate a population against infection, changes to education systems take a very long time to implement. Education is also highly political, and all too frequently in parliamentary democracies it can become a plaything of politicians, each of whom wants to be seen to be implementing their own policies to replace those of the previous government or minister. This is especially so with the use of new digital technologies, which can actually detract from the long-term implementation of the major programmes of educational reform that remain necessary in most countries of the world. Where possible, it is therefore desirable for cross-party agreement and commitment to be reached for appropriate long-term (5-10 years) use of digital technologies in education. Where multi-party democracy is not the norm, leaders should nevertheless also seek to put in place long-term visions and educational policies that include ways through which appropriate technologies can be implemented effectively and wisely.[64] These commitments should as far as possible be technology neutral, so that they can not only maximise the potential of existing or even older technologies, such as radio and TV, but also be flexible enough to utilise the latest technological developments such as Artificial Intelligence (AI) or Virtual Reality.

[63] Ferguson-Paré, M. (2011) Perspectives on leadership: moving out of the corner of our room, *Nursing Science Quarterly*, 24(4): 393–396, doi: 10.1177/0894318411419214; and Heifetz, R.A. (2006) Public leadership. Mobilizing for adaptive work, in: Budd, L., Charlesworth J., and Paton R . (eds) *Making Policy Happen*, New York: Routledge, 234-246.

[64] China, for example, introduced a ten-year development plan for ICT in education in 2010, which includes the ambition of ensuring that all schools will have broadband access, that appropriate quality learning resources will be developed, that universities should provide Massive Open Online Courses (MOOCs) to provide teachers with the necessary skills (good examples of MOOCs developed for teacher training by the School of Education at Peking University are available at http://tmooc.icourses.cn/), and that private companies should work with local schools to develop apps and software relevant to their needs (see also Di Wu (2014) An introduction to ICT in education in China, in Huang R., Kinshuk, Price J. (eds) *ICT in Education in Global Context*, Berlin: Springer, 65-84).

8.3 A holistic cross-government approach

The effective and appropriate use of digital technologies within education systems is hugely complex, and requires many different skills, disciplines, and expertise. It is therefore essential for governments to adopt holistic and integrated approaches to this process, bringing together the many different government departments involved, under the leadership of a charismatic and influential senior government figure (see Sub-Section 8.2 above). At a minimum, the following Departments or Ministries (or their equivalents) need to be involved: Education, Telecommunications/ICT, Finance, Infrastructure, Planning, Security/Internal Affairs, Labour/Employment, the ICT/Telecom Regulator, and the Media Regulator (see Annex 3). All too often programmes for the use of digital technologies in education are led either by an ICT Ministry (which does not have sufficient educational expertise) or an Education Ministry (which does not sufficiently understand the potential and pitfalls of the technology). It is scarcely surprising therefore that so many of these initiatives fail.

Moreover, such a holistic approach is also essential because the education system impacts all aspects of a society. Education systems are expected to provide skills for the labour market, the critical acuity to be able to resolve complex challenges, the wisdom to reach right judgements, the inspiration for innovation, and the responsibilities necessary for a society that cares for and supports its most vulnerable citizens and the aliens in its midst. This has become especially apparent during COVID-19.

It is also essential for cross-government approaches to be put in place so that appropriately holistic funding mechanisms can be developed and implemented (see Section 14). The provision of infrastructure, for example, needs to be a government-wide agenda so that individual ministries do not wastefully duplicate their efforts, and integrated digital connectivity and electricity networks can instead be created that serve multiple government service, including civil registration, welfare, health, and education. At the same time, an important underlying principle should always be that alternative delivery mechanisms must continue to be put in place to serve the needs of those who do not have access, or are unable, to use such networks and digital technologies.

8.4 Involving all parts of society

COVID-19 has reminded everyone that all parts of society also need to be involved in and committed to the crafting of new education system. Parents and grandparents in many parts of the world have become much more involved in supporting their children's education out of school; employers have discovered that their employees do not have the necessary skills to be able flexibly to turn to new tasks necessitated by the pandemic (see Section 9 for further discussion).

In particular, it is important to engage closely with both the private sector (not least for their key role as employers) and also civil society, including teachers' unions and NGOs providing additional levels of support and expertise in working with

marginalised communities (see Guidance Note on Partnerships). The private sector, for example, should not be seen merely as a vehicle for providing additional funding or technological resources for education systems, but rather should be valued primarily for its understanding of the technologies, its management expertise, and its focus on sustainability.[65] In setting the educational vision for a country, it is also essential to consult widely with representative groups from civil society, who are well-placed to provide insights into the values and aspirations of varying groups of citizens.

In 2017, 42% of the world's population was estimated to have been under 25, and in 2019 there were about 1.2 billion youth aged 15-24, representing 16% of the world's population.[66] It has become widely recognised that these younger people should also have a stronger say in their own futures, and it is thus important that they too, along with other traditionally silenced voices, are given a voice in shaping an educational vision for the future (see Guidance Note on learners' voices). People with disabilities, marginalised ethnic groups, women and girls in patriarchal societies, refugees and displaced persons and those living in isolated areas, also need to be closely involved in the design and implementation of any programmes intended to use digital technologies to enhance their learning. They know best about their own needs and aspirations.

8.5 Development and implementation of clear policies and strategies

Many countries of the world already have good policies and strategies for the inclusion of digital technologies in their education systems. All too often, though, these remain on the shelves, and are not fully implemented successfully. Sometimes this is because they have been prepared by external consultants, who know little about the countries in which they are working, and have not sufficiently consulted with the wide diversity of people who need to be involved in shaping such documents. On other occasions it is because government officials do not have any incentive to implement them, or do not have access to sufficient resources to be able to do so. In yet other contexts it is because a new political party comes to power and wants to be seen to be doing something new and different from their predecessors, and sets about reinventing the educational wheel.

Whatever the reasons, it is essential for such policies and strategies to be developed holistically, cogently, and realistically, with a focus and commitment on delivery. Moreover, the use of appropriate digital technologies needs to be an integral part of comprehensive national education policies, rather than a stand-alone add-on element. As argued in Part I of this Report, the main emphasis of such policies needs to be on the achievement of educational objectives across the entire system, and how technology can best support them, rather than on ways through which the education system can merely be used to enhance the wider use of digital technologies in society. Digital technologies must be used primarily to serve the needs of education, rather than the other way around.

[65] Unwin, T. and Wong, A. (2012) *Global Education Initiative: Retrospective on Partnerships for Education Development 2003-2011*, Geneva: World Economic Forum.
[66] UNDESA (2019) International Youth Day, 12 August 2019, https://www.un.org/development/desa/youth/wp-content/uploads/sites/21/2019/08/WYP2019_10-Key-Messages_GZ_8AUG19.pdf.

As UNESCO has so clearly stated, "Solid, coherent policies and plans are the bedrock on which to build sustainable education systems, achieve educational development goals and contribute effectively to lifelong learning".[67] To this end, it has provided a wealth of good practice guidance that governments can adopt, and its International Institute for Educational Planning (IIEP) has been providing substantial such guidance for countries since it was established in 1963.[68] Likewise, regional specialist organisations such as the Commonwealth of Learning (COL) have also provided focused advice on issues such as open and distance learning, which especially address the potential role of digital technologies in delivering effective education systems.[69] Indeed, its Pan-Commonwealth Forum on Open Learning (PCF10) in 2022 will specifically address the issue of building educational resilience.[70]

COVID-19, though, has highlighted that traditional educational planning and policy making has insufficiently addressed the ways through which digital technologies, both old and new, can be used effectively to help ensure resilience. This is a recurring theme in many of the more detailed recommendations that follow, which highlight the ways through which they can be used to supporting flexible learning modalities, to deliver blended learning practices, to engage learners in new ways, and to develop the rapidly changing skill sets needed to find gainful employment or to become successful entrepreneurs in the context of pandemics and emergencies.[71] Importantly, many of these solutions also serve the needs of some of the most marginalised people who have never previously had the opportunity to participate in formal education systems.

[67] UNESCO (no date) Education Policy and Planning, https://en.unesco.org/themes/education-policy-planning.
[68] UNESCO International Institute for Educational Planning, http://www.iiep.unesco.org/en/institute.
[69] Commonwealth of Learning (COL) https://www.col.org.
[70] Commonwealth of Learning (COL) Building education resilience: focus of the Pan-Commonwealth Forum on Open Learning in 2022, https://www.col.org/news/press-releases/building-education-resilience-focus-pan-commonwealth-forum-open-learning-2022
[71] Fisher, J. F., Bushko, K., and White, J. (2017) *Blended Beyond Borders: A Scan of Blended Learning Obstacles and Opportunities in Brazil, Malaysia, & South Africa*, RR. 5.2017, Doha: World Innovation Summit for Education and Clayton Christensen Institute for Disruptive Innovation.

The five most important things for governments to get right in using digital technologies for education and learning by the most marginalised

9. A whole society approach: delivering equity in education

The COVID-19 pandemic has been a stark reminder that effective education requires a "whole society" approach, especially if it is to benefit the poorest and most marginalised. This principle must therefore be incorporated by governments into all of their planning and strategic thinking on ways through which they can ensure resilient and appropriate education systems in the future. This involves families, communities, companies, civil society organisations, and learners themselves. COVID-19 has presented very real challenges for those families with children in schools across the world as they have had to adjust to learning from home, but it must never be forgotten that for those children unable to participate in formal education systems little as far as their learning is concerned has actually changed. This is therefore an important opportunity for governments to ensure equity in educational opportunity as outlined in Part I. It costs more to deliver education for the most marginalised, but the social, political, cultural and economic returns from doing so are very high.

The six interconnected and most important elements required for such a "whole society" approach that are summarised in this section are:

1. Adhering to the principle of equity in education: serving the most marginalised
2. Recognising and supporting the role of families and communities: we all teach and learn
3. Working constructively with the private sector
4. Using digital technologies effectively to support employment and vocational training
5. Recognising the importance of wellness and well-being
6. Involving learners in educational decision making at appropriate levels

These are particularly supported by specific Guidance Notes on the following:

- Learners and youth voices
- Partnerships with the private sector and civil society
- Uses of digital technologies in support of employment and training for work

9.1 Adhering to the principle of equity in education: serving the most marginalised

Governments should begin by using digital technologies with the most marginalised in contexts and places where it is most difficult to succeed

The principle of equity in education is well established, but has become particularly highlighted as a result of the COVID-19 pandemic. Governments concerned with ensuring that the most marginalised benefit from the use of digital technologies in their education systems need to differentiate between notions of equity and equality. Equality is usually defined mainly in the sense that everyone is treated equally. For example, every 10-year-old child could be given a tablet computer for free so that they could use it to learn at school and at home. However, not all would benefit the same from such provision, even if it was actually possible to give them all tablets. One child might not have access at home to connectivity and electricity to be able to use the tablet, whereas another might have parents who could afford to pay for unlimited connectivity. The learning impact of an "equal" gift, the tablet, would be different. The child who could not afford connectivity and electricity would need to be given additional resources to be able to have the same benefits. This is what "equity" is all about.[72]

Equity in education is usually considered through two related dimensions: fairness and inclusion. The above example is one of fairness. In essence, this implies that personal circumstances such as wealth or gender, should not prevent someone from achieving their educational potential. Inclusion in education refers to everyone being able to gain similar basic minimum levels of attainment in, for example, being able to read, write and do basic mathematics. Across the world, the percentages of people who achieve such standards vary very significantly between and within countries. It is generally recognised that activities in three areas are essential for equity to be achieved, although the emphasis will vary in different contexts: the overall design of education systems, teaching and learning practices within schools and elsewhere, and the need to allocate resources differentially.

In essence, with respect to the use of digital technologies in education this requires a fundamental shift of emphasis to one where governments agree to allocate their limited resources first to those most in need rather than to those for whom it is easiest to provide quality education. No longer should digital technology be rolled out

[72] OECD (2008) Ten steps to equity in education, *Policy* Brief, Paris: OECD, https://www.oecd.org/education/school/39989494.pdf; UNICEF (2015) *The Investment Case fo Education and* Equity, New York: UNICEF; OECD (2018) `*Equity in Education: Breaking Down Barriers to Social* Mobility, Paris: OECD; Masters, G. (2018) What is 'equity' in education?, *Teacher: Evidence+Insight+Action*, 30 April 2018, https://www.teachermagazine.com.au/columnists/geoff-masters/what-is-equity-in-education.

in pilot projects in places where they are most likely to succeed, but instead they should be piloted where it is most difficult. The notion of "low hanging fruit" so beloved of companies, governments, civil society organisations and international donors, should be rejected. No longer should we refer to "the last mile" or the "bottom billion", but instead to the "first" mile and "first" billion, because these are the most important.

Put simply, governments should concentrate first on ways of using digital technologies to support learning by the most disadvantaged and marginalised if they wish to deliver on equity in education

9.2 Recognising and supporting the role of families and communities: we all teach and learn

One of the most visible and far-reaching experiences of COVID-19 has been the way that school closures have meant that parents whose children previously went to school became much more involved in their learning experiences. Parents across the world have suddenly woken up to the realisation that teaching and training are difficult and valuable. This is therefore an ideal time to help reshape social attitudes towards the teaching profession, and to build education systems where the work of teachers is appropriately rewarded and valued.[73]

Moreover, COVID-19 has also reinforced the observation that lifelong and lifewide education and learning[74] have always taken place as much outside the classroom as within it. Parents and grandparents are learning from their children and grandchildren, apprentices learn on the job, the children of farmers learn in the fields, out-of-school children learn on the streets. This is therefore also a good opportunity for governments to develop systems that take into account, and support, learning in these very different and difficult contexts. Digital technologies, by theoretically enabling access to learning resources anywhere and anytime, are thus of great importance in supporting such a holistic vision of education systems.

Again, though, context matters. Where both parents have to earn an income, it is impossible for one of them to stay at home to deliver education for their children, especially if there are no grandparents available to care for them. Yet in some cultures, it is indeed the normal expectation that one parent, usually the mother, will indeed stay at home to provide such learning support. In such circumstances it is essential that those providing educational delivery are able to access the appropriate resources so that their children or grandchildren are not disadvantaged by not being in school. However, and especially in marginalised communities, many families in the short-term also often prioritise their own children working to earn an income over ensuring that they have a school education. Even where cultural values emphasise the importance of learning, the necessity for households to generate sufficient income to sustain themselves often means that children are forced to drop out of the education system.

[73] Dolton, P., Marcenaro, O., De Vries, R. and She, P-W (2018) *Global Teacher Status Index*, London: Varkey Foundation, https://www.varkeyfoundation.org/media/4867/gts-index-13-11-2018.pdf.
[74] As a reminder, lifelong learning occurs throughout the life cycle and lifewide learning involves real contexts and settings.

This holistic view of education extends to the provision of learning opportunities after young people have left school. COVID-19 has presented a rare opportunity for governments and communities to reassess how digital technologies can be used appropriately and effectively for lifelong and lifewide learning. In particular, as discussed further below, it is essential for governments to consider means through which education systems can be sufficiently flexible to enable people to gain the appropriate skills, not just technical[75] but also social, cultural and political, needed to lead fulfilled lives. This requires communities at a range of scales also to play an increased role in supporting the learning aspirations of those within them, through the appropriate development of relevant content, the provision of appropriate training, and the means through which their members can gain access to them.

As schools and formal education spaces re-open following the pandemic, most are realising that their traditional spaces are insufficient to provide safe socially-distanced learning opportunities. This is another area where local communities can become involved by providing alternative places for learning. In some contexts, it will be safer to learn in the open air outside the classroom, where children can be more widely spaced. In others, large communal spaces such as marriage halls or warehouses, either privately or collectively owned, might also be used as makeshift schools. Such provision should be a systematic aspect of all resilient education systems, also coming into play for example when storms or earthquakes decimate an area. Such "alternative-school" locations must therefore also be remembered when developing connectivity solutions for learning; simply connecting schools is only a beginning.

9.3 Working constructively with the private sector

The private sector plays four main roles within the education system: companies employ the products of education systems; they produce many of the educational resources used within them; they deliver education themselves; and they generate taxes for governments to spend on education. In some countries, they also have considerable influence, both directly and indirectly, in shaping the ideas of politicians and the policies of governments. Over the last 25 years, they have also had a very strong role in persuading governments to introduce digital technologies into their educational systems, both for the learning benefits that these can provide, and also for the increased market share and profits that they can make in the interest of their shareholders and employees. This has been particularly true during the COVID-19 pandemic.

An important role of government funded education systems is undoubtedly to equip young people with the technical skills that they require for gainful employment or entrepreneurship (see also Sections 3 and 9.4). Companies expect that the taxes they pay are used wisely on education so that they do not have to teach their employees the basic skills required for the jobs that they want doing. The failure of

[75] Van Laar, E., Van Deursen, A. J., Van Dijk, J. A., & De Haan, J. (2017). The relation between 21st-century skills and digital skills: A systematic literature review. *Computers in human behavior*, *72*, 577-588.

many education system to deliver the basic requirements of reading, writing and arithmetic, let alone more advanced skills, is thus one of the main factors limiting economic growth in many countries, especially in Africa. In 2018, the UNESCO Institute of Statistics thus reported that globally 60% of children and adolescents are not learning at all, and more than 617 million children are not even reaching minimum proficiency levels in mathematics and reading.[76] However, education is not just about the acquisition of technical skills, and it is at least as important that education systems address the social, cultural and political skills necessary for people to flourish.

It is therefore very important for governments to engage proactively and constructively with the private sector to create education systems and curricula that are fit for purpose in a rapidly changing world. This requires flexible approaches that in part do indeed seek to provide the skills necessary for work (see Section 9.4 below), but also more widely seek to ensure that digital technologies are used appropriately in the delivery of learning that goes beyond just the technical. Moreover, the private sector can also play an important role in setting high quality standards, as with some private sector universities, which are now offering guarantees that their graduates will be able to obtain gainful employment.[77] Furthermore, creative partnerships between governments and the private sector are an important means through which connectivity and content can be made available in contexts where the private sector alone is unable to cover its costs of delivery. Such partnerships are all the more likely to succeed when they also involve civil society and community organisation in their design and delivery (see Guidance Note on effective partnerships).

9.4 Using digital technologies effectively to support employment and training for work

Training that emphasises skills and knowledge required for a particular job is all too often given lower status than learning more "academic" subjects within education systems (see Guidance Note on learning and training for employment).[78] Moreover, they are often seen as being distinct from mainstream education, are frequently the responsibility of a separate ministry or department, and are usually less well funded than basic and higher education.

It is important for governments to include employment-related training as integral to wider national and international education systems if people are indeed going to find gainful employment and fulfil their wider roles in society throughout their

[76] UNESCO Institute for Statistics (2018) Fact Sheet No. 48: One in five children, adolescents and youths is out of school, UIS/FS/2018/ED/48, http://uis.unesco.org/sites/default/files/documents/fs48-one-five-children-adolescents-youth-out-school-2018-en.pdf; UNESCO Institute for Statistics (2018) Fact Sheet No. 46: More than one-half of children and adolescents are not learning worldwide, UIS/FS/2018/ED/46, http://uis.unesco.org/sites/default/files/documents/fs46-more-than-half-children-not-learning-en-2017.pdf

[77] For a South African example, see Boston City Campus and Business College, https://www.boston.co.za/about-us/graduate-plus/.

[78] Vocational training is defined here as any "Training that emphasizes skills and knowledge required for a particular job function (such as typing or data entry) or a trade (such as carpentry or welding)" (see Business Directory, http://www.businessdictionary.com/definition/vocational-training.html).

lives.[79] This is especially so as more people are increasingly having to retrain and gain new skills because of rapid changes in the use of technologies. Unfortunately, many traditional TVET (Technical and Vocational Education and Training) programmes have not been particularly cost-effective, and as a result have often been seen by some governments and donors as being a poor return on investment.[80] There are considerable debates over this issue, but governments should nevertheless seek to optimise the use of digital technologies in providing innovative ways through which such training can be provided. Our consultations, for example, provided considerable support for the development of novel ways of using such technologies in helping young people become more employable.

For too long vocational training has been seen as being inferior to higher education in prestige. This is one of the main factors that have led to a proliferation in the number of universities across the world, many of which fail to provide students with the skills and experiences necessary to find gainful formal employment on graduation. This is particularly so in Sub-Saharan Africa with its very high rates of graduate unemployment. As an Agence Française de Développement and World Bank report notes, "If university graduates acquire degrees and knowledge that have little practical application in Africa's fast-changing labor force, then their investment of time and money will have been largely in vain, with few prospects for strong careers in the private sector".[81] Against this background, it also becomes increasingly important for education systems to give young people the skills to become entrepreneurs should they so choose instead of relying on others to provide them with employment. If young people in Africa, for example, do not gain the skills and knowledge to contribute beneficially to the economic vitality of countries throughout the continent, the much-vaunted "youth dividend"[82] resulting from the Africa's demographic structure will instead become a "youth millstone" around the necks of the governments and people of the continent.

Traditionally, training that emphasises skills and knowledge is often seen as being mainly "hands on" and therefore less susceptible to the use of digital technologies in its delivery. It has also traditionally often been poorly delivered, in part because of the lack of resources and attention paid to it. Nevertheless, recent digital developments, especially in the fields of Virtual (VR) and Augmented (AR) Realities, have provided novel opportunities for people to gain many new skills without actually

[79] See, for example, ILO (2020) Skills note: Distance learning during the time of COVID-19, Geneva: ILO; ILO and UNESCO (2020) *The Digitalisation of TVET & Skills Systems*, Geneva: ILO; Latchem, C. (ed.) (2017) *Using ICTs and Blended Learning in Transforming TVET*, Paris and Burnaby, BC: UNESCO and COL; and UNESCO IITE (2003) *Analytical survey: the use of ICTs in Technical and Vocational Education and Training*, Moscow: UNESCO IITE, https://iite.unesco.org/pics/publications/en/files/3214613.pdf.

[80] However, see UNESCO (2020) *Understanding the Return on Investment from TVET: A Practical Guide*, Paris and Adelaide: UNESCO and National Centre for Vocational and Education Research, https://unevoc.unesco.org/pub/roi_practical-guide1.pdf.

[81] Filmer, D. and Fox, L (2014) *Youth Employment in Sub-Saharan Africa*, Washington DC: Agence Française de Developpement and World Bank, http://documents1.worldbank.org/curated/en/424011468192529027/pdf/Full-report.pdf.

[82] Page, J., Wallace, L., Altenburg, T., Grunewald, A., and Fox, L. (2019) Harnessing Africa's youth dividend: a new approach for large-scale job creation, https://www.brookings.edu/wp-content/uploads/2019/01/BLS18234_BRO_book_007_CH3.pdf, Chapter 3 of *Foresight Africa: Top Priorities for the Continent in 2019*, Washington, DC: Africa Growth Initiative at Brookings, https://www.brookings.edu/wp-content/uploads/2019/01/BLS18234_BRO_book_007_WEB1.pdf.

experiencing these directly.[83] Moreover, in a world of work that is increasingly digital, many new jobs require skills that by their very definition can be learnt digitally or online.[84] Furthermore, there are increasing numbers of innovative and creatives ways through which skills training is being provided through the quite basic use of communication apps such as WhatsApp that are giving young people useful employment-related skills.[85] Indeed, one of the outcomes of COVID-19 may well be a complete reorganisation of the 20th century office environment, with remote working from home becoming the norm, and tower blocks of offices becoming largely redundant.

Governments should integrate work-related training more centrally within the wider education system, and to promote the effective use of digital technologies for employment, not least in preparedness for the new skills that are likely to be required in the future.

9.5 Creating learning environments that promote wellness and wellbeing

A very important outcome of our consultations for this report was the emphasis placed by participants on the intersection between COVID-19, wellness, wellbeing, education and digital technologies.[86] There was widespread recognition of the mental stress caused by lockdown and domestic pressures in circumstances where parents had to work and children learn all in the same enclosed space. Parents and children were stressed, and so too were teachers many of whom were forced to learn new skills that they had never used before to teach online.[87] This applies not only in the richer countries of the world, but also in those that are economically poorer.[88] One outcome of this was that in many circumstances teachers have simply tried to teach in the only

[83] Palkova Z., Hatzilygeroudis I. (2019) Virtual reality and its applications in vocational education and training, in: Zhang Y. and Cristol D. (eds) *Handbook of Mobile Teaching and Learning*. Springer, Singapore, https://doi.org/10.1007/978-981-13-2766-7_88.

[84] Brolpito, A., Lightfoot, M., Radišić, J. and Šćepanović, D. (2016) *Digital and Online Learning in Vocational Education and Training in Serbia*, European Training Foundation, https://www.etf.europa.eu/sites/default/files/m/DC024C02AA9B9384C12580280043A0B6_DOL%20in%20VET%20in%20Serbia.pdf; Achtenhagen, C. and Achtenhagen, L. (2019) The impact of digital technologies on vocational education and training needs: an exploratory study in the German food industry, *Education + Training*, 61(2): 222-233, https://www.emerald.com/insight/content/doi/10.1108/ET-05-2018-0119/full/html.

[85] See for an example from Tanzania: HLDF (2017) Understanding the ecosystem: the case of DOT, https://hdif-tz.org/understanding-the-ecosystem-the-case-of-dot/.

[86] In general usage, wellbeing refers to the holistic experience of feeling well and content, whereas wellness refers primarily to physical health. See also, WHO (2020) Mental health and psychosocial considerations during COVID-19 outbreak, https://www.who.int/docs/default-source/coronaviruse/mental-health-considerations.pdf?sfvrsn=6d3578af_2.

[87] See, for example, EIS (2020) Overwhelming survey response from teachers confirms Coronavirus impact on education, https://www.eis.org.uk/Latest-News/2020survey; UNESCO (2020) Teacher task force calls to support 63 million teachers touched by the COVID-19 crisis, https://en.unesco.org/news/teacher-task-force-calls-support-63-million-teachers-touched-covid-19-crisis.

[88] Bartuska, A..D. and Marques, L. (2020) Mental health and COVID-19 in developing countries, *OECD Development Matters*, https://oecd-development-matters.org/2020/08/04/mental-health-and-covid-19-in-developing-countries/; see also Rehman, U. *et al*. (2020) Depression, anxiety and stress among Indians in times of COVID-19 lockdown, *Community Mental Health Journal*, 1-7, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7309680/;

ways that they knew how, but using digital technology, instead of learning to use digital technologies to teach in new and better ways. There is also evidence from a major survey in the UK that just over half of all parents with school-aged children said that they had struggled to continue with their education during lockdown, and just over three-quarters said that a lack of motivation was one of the reasons.[89]

It seems likely that as more schools globally reopen many people will breathe a huge sigh of relief: parents will no longer have to try to teach, children will be able to socialise again with their friends, and teachers will go back to their old ways of doing things. It is therefore important for governments to build on the positive lessons learnt from the pandemic about how digital technologies can indeed be used to support wellness and wellbeing in the context of education rather than simply allowing everything to revert to an old normal.[90] These include the ability to teach and learn at a distance, the opportunities for social networks to be maintained through social media, the reduction in accidents and injuries travelling to and from school, and the cessation of physical bullying and violence at school.

Nevertheless, lockdowns have exacerbated mental health problems across the world, and digital technologies, especially social media, have also been used to increase dramatically the levels of online abuse and harassment.[91] This emphasises the important need for governments to place the highest priority on the safe use of digital technologies not only in schools but also within wider aspects of educational delivery (see Section 13).

9.6 Involving learners in educational decision making at appropriate levels

A final aspect of a whole society approach to education and learning through digital technologies for government to consider is the ways through which these can be used appropriately to encourage learner participation, not only in terms of making learning interesting, but also through their involvement in shaping curricula and content (see Guidance Note on learner engagement). The experiences of learners through the COVID-19 pandemic, for example, have been particularly important in helping teachers, families and governments better understand how young people engage with such technologies in the learning process and how this information can be used most effectively to enhance learning systems.[92]

[89] ONS (2020) Coronavirus and homeschooling in Great Britain: April to June 2020, https://www.ons.gov.uk/peoplepopulationandcommunity/educationandchildcare/articles/coronavirusandhomeschoolingingreatbritain/apriltojune2020.

[90] See Cardero, D.L. (2020) Educating for well-being: the need for systemic socio-emotional learning and motion leadership, https://www.wise-qatar.org/educating-for-well-being-the-need-for-systemic-socio-emotional-learning-and-motion-leadership/.

[91] See Canadian Teachers' Federation (2020) National teacher survey reveals that all is not well in education during the time of COVID, *CISION*, https://www.newswire.ca/news-releases/national-teacher-survey-reveals-that-all-is-not-well-in-education-during-the-time-of-covid-860201803.html; and Unwin, T. (2020) Responding to digital violence in pandemics: how to take action during COVID-19, *Cybervictim.help*, https://93bits.com/cyber-victim-help/responding-to-digital-violence-in-pandemics/.

[92] See, for example, Pearson/Wonkhe (2020) *Pearson/Wonkhe Student Expectations Survey*, https://wonkhe.com/wp-content/wonkhe-uploads/2020/07/Pearson-Wonkhe-student-expectations-survey-published-version.pdf.

Digital technologies can be used effectively to provide new and interesting content and modes of delivery that may encourage learners who do not currently participate in formal learning for whatever reason to start to do so. Innovative short learning snippets or bite-sized learning can be very effective, especially when using video formats or gaming activities to encourage people to learn.[93] When children are living on the streets or in places where they have little opportunity otherwise to learn, the availability of short but powerful learning resources delivered online can be very beneficial. Governments can do much to support the creation of such resources, tailored specifically to the needs of marginalised communities.

Furthermore, when learners are involved in helping to craft their own curriculum and content, they frequently engage more and acquire greater skills and knowledge as a result. Education with learners, and not just for them, is thus an important part of a whole society approach to education and learning. The Guidance Note specifically on the voices of learners and young people provides straightforward advice for governments on how digital technologies can be used to support such an agenda.[94] A particularly important recommendation is thus that governments should put in place mechanisms through which learner's voices can be heard and acted upon appropriately at all levels in the education system.

[93] Sh!ft (2018) 8 commandments of bite-sized learning, https://www.shiftelearning.com/blog/commandments-of-bite-sized-learning; Elucidat (2019) Why bite-sized elearning is important, https://www.elucidat.com/blog/bite-sized-elearning; Blue, J. (2018) Little and often: bite-sized learning, Cambridge University Press, https://www.cambridge.org/elt/blog/2018/04/26/bite-sized-learning/.

[94] For a wider global initiative bringing together young people and leaders from the private sector, governments and UN agencies, see Generation Unlimited, https://www.generationunlimited.org.

10. Enabling access for all: building resilient infrastructures for education[95]

The term "infrastructure" refers to the basic facilities and systems serving a community. Traditionally within education systems, the main infrastructures have been the physical school, college and university classrooms, laboratories, libraries and lecture theatres that have provided places in which people can learn. Such buildings and their contents are likely to remain important for the foreseeable future, albeit changed in character and design. However, the advent of digital technologies, with their ability to separate information sharing and communication from the traditional places in which they occurred, has the potential completely to transform the character of learning. COVID-19 has thus shown that schools can function without their buildings, although as argued elsewhere in this report this has not been without its challenges in terms of social interaction and mental health issues (see Section 9.5). In a world in which use of the Internet is becoming ever more dominant in all walks of life, especially for lifelong and lifewide learning, access to Internet connectivity and the electricity used to power digital technologies are therefore vital new infrastructures that have become critically important in the provision of education.

Building resilient infrastructures is essential to ensure equality of access in education, especially for the poorest and most marginalised. COVID-19 has shown that online learning is significantly easier for students who have strong academic backgrounds, reliable Internet connections, sufficient technology, and families with more resources and flexibility. However, it is much more challenging for students who lack these resources to benefit. Therefore, governments should consider various interrelated factors and develop strategic plans to enable all learners to access resilient infrastructures that can be used to deliver distance education, focusing first on the most marginalised. This involves not only reliable connectivity and access to technologies but also organised action among teachers, school administrations, families, civil society organisations, companies, and learners. It also means that it is essential for governments to identify the most relevant and affordable options, and not simply concentrate on trying to provide electricity and Internet connectivity to schools. Such infrastructures are also becoming increasingly important for the delivery of other government services, including health and welfare, and it should not therefore be the role of Ministries of Education to tackle such challenges alone. This is why this Report places such emphasis on the importance of an integrated and holistic cross-government approach to serving the poorest and most marginalised (Section 8) as well as a whole society approach to delivering equity in education (Section 9). Readers of this section must not fall into the trap of thinking that its recommendations imply that Ministries of Education should pay for all of the infrastructure proposed; far

[95] The lead authors for Section 10 were Müge Haseki, Leon T. Gwaka, and Christopher S. Yoo.

from it. Specific funding recommendations involving a range of stakeholders are instead offered for all of the Report's recommendations in Section 14. The intention here is to help empower Ministers of Education to say "No" to those advocating that they should simply purchase laptops for every child, or cover the costs of grid electricity and Internet connectivity for every school, in the hope that this will automatically improve learning outcomes.

There are five interrelated and important elements required for building resilient infrastructures that enable as many learners as possible to have access to digital technologies:

1. Providing digital connectivity beyond schools: ensuring resilience
2. Connecting schools: access to the Internet and electricity
3. Creating innovative opportunities for achieving access for the most marginalised
4. Crafting infrastructures for lifelong and lifewide learning
5. Linking to global infrastructure initiatives involving the private sector and civil society

These are particularly supported by specific Guidance Notes on the following:

- Ensuring resilient connectivity
- Resilient and sustainable energy solutions

10.1 Providing digital connectivity beyond schools: ensuring resilience

Governments need to develop resilient education systems to ensure that the most marginalised can continue with learning activities at all times and wherever they are. This may for example include using alternative technologies, such as paper and books or wind-up radios that also serve as lights, for ensuring that those without reliable Internet connectivity can continue to learn. Resilience is usually defined as the ability to overcome adversity and to adapt to challenging situations. In the context of education, resilience can thus be considered as the ability of education systems to continue/restart operations when schools close due to unforeseen circumstances such as COVID-19 or future environmental crises. Governments with a high level of resilience act and rebuild quicker than those with fragile systems.

To build resilient education systems, there are four important areas that governments should address: (1) electricity and Internet connectivity, (2) alternative ways through which to deliver distance education (e.g., radio, TV, online learning, mobile phones), (3) instructional and technical teacher support, and (4) creating safe and convenient learning environments. Electricity and the Internet are discussed in more detail in section 10.2 below (and see also relevant Guidance Note).

Where electricity, Internet, and digital devices are limited, broadcasting radio or TV lessons is a good alternative option to enable learners to continue schooling, especially where there is existing experience and capacity to do this within the

education system.[96] Most countries have state, private, and community radio or TV stations that can potentially be used to support the education of learners. While broadcasting live lessons is often the fastest way to get started for countries with limited or no experience, broadcasting existing pre-recorded material is also a useful option for countries with existing educational programs. It is important, though, to build capacity within the system for teachers, facilitators and community assistants to be able to use such resources effectively (see Guidance Note on teacher training). Furthermore, conflicting demands within households and communities can limit the availability of these technologies for learners to use. As an example, Cabo Verde uses radio dramas, lessons, tutoring, and other educational broadcasts to reach students effectively on its 10 islands.[97]

Alternatively, in countries with high mobile phone adoption rates, mobile phones and educational apps can be used to access content. FundZa, a digital skills training programme in South Africa, for instance, has reached 13 million users with reading materials through its mobile site (a library on a phone).[98] Whilst reach does not necessarily equate to impact, this is an important measure of what can be achieved when such technologies are indeed used effectively. Many education websites, such as Khan Academy, also have app-based versions of their web content.

Governments should ensure that teachers have the necessary levels of support, both technologically and instructionally (see also Section 12). Governments in the first instance need to ensure their teachers who are used to using digital technologies continue to have access to them (such as computers, tablets, mobile phones) to allow for distance education. When schools closed because of COVID-19 in the Kyrgyz Republic, for instance, teachers were provided with free SIM cards to access educational material online and WhatsApp.[99] When resources are limited, alternatively, governments can invest in public spaces such as schools and libraries where teachers can access the devices. However, providing access and devices is not enough; teachers must also know how to use the technologies effectively. During COVID-19, the Ministry in Lebanon thus trained their teachers to record and upload documents and hold virtual classes more effectively. To reduce the burden on teachers, Zaya Learning Labs in India has been recruiting and training teaching assistants from local communities since 2013, and this has played a critical role in their technology-based education programme.[100]

Governments should also ensure that the new learning environment is conducive for learners. If the learning is to take place at learners' homes, governments

[96] See, for example, the well-established work of Mediae in East Africa, https://mediae.org. EdTech Hub and eLearning Africa (2020) *The Effect of Covid-19 on Education in Africa and its Implications for the Use of Technology*, London: EdTech Hub and eLearning Africa reports that educational TV and radio are seen as the most important technologies in sustaining learning for primary students in Africa during the COVID-19 pandemic, https://www.elearning-africa.com/ressources/pdfs/surveys/The_effect_of_Covid-19_on_Education_in_Africa.pdf.

[97] See, for example, Burns, M. (2020) School interrupted: 4 options for distance education to continue teaching during COVID-19, *UKFIET*, https://www.ukfiet.org/2020/school-interrupted-4-options-for-distance-education-to-continue-teaching-during-covid-19/.

[98] See FundZA, http://www.fundza.co.za/.

[99] For Kyrgyz Republic's response, see https://www.worldbank.org/en/topic/edutech/brief/how-countries-are-using-edtech-to-support-remote-learning-during-the-covid-19-pandemic.

[100] See, https://www.zaya.in/.

can run awareness campaigns to encourage families to provide accountability and parental support for their children's schoolwork. If the learning is to take place outside learners' homes, governments must ensure safe and convenient locations for learners to have access. Fusion, a digital skills training programme in Sri Lanka, has thus showed that girls are more likely to attend these programs if the classes are offered at safe and convenient locations such as schools, libraries, or Internet cafes.[101] Where there is good connectivity, governments could also choose to provide education through an existing online platform, such as Kolibri or YouTube, quite quickly, enabling those who have devices to be able to have continuity of learning opportunity

10.2 Connecting schools: access to the electricity and Internet

COVID-19 has highlighted once more that reliable and affordable electricity and access to the Internet are essential for schools to transition to online learning.[102] However, the most-marginalised groups are often located in areas off the grid, and therefore do not have the potential to benefit. For these groups, governments can expedite rural electrification programs through partnerships with non-government entities such as Alliance for Rural Electrification (ARE),[103] which focuses on extending electricity access to rural areas (see also Guidance Note on electricity provision). For countries experiencing energy insecurity, power disruptions must also be minimized to ensure learners can continue learning during school closings. As a result, power utility companies have embarked on power management strategies such as load-shedding, which can potentially disrupt learning. Where power rationing is practised, governments should ensure that their load shedding schedules are fair, and that educational systems are disrupted as little as possible.[104]

To avert the energy insecurity, governments must promote initiatives supporting renewable energy (see Guidance Note on Electricity). Other suggestions include the use of generators to provide electricity when the grid is down, although the environmental impacts of the use of non-renewable fuels must also be taken into consideration. Governments can emulate the Federal Government of Nigeria's Energizing Education initiative,[105] which allows educational institutions to be off the national grid and to generate their own renewable power. In addition to providing ten learning institutions with power, this initiative is also contributing to street lighting meaning that the community also enjoys spillover benefits. To finance these initiatives, governments can explore multi-sector partnerships, such as the Republic

[101] For Fusion's work, see https://fusion.lk/.
[102] Moreover, initiatives such as GIGA which is mapping existing schools in order to improve their connectivity have themselves identified schools that were not previously known (as in Colombia where UNICEF reported finding 2000 schools of which the government was unaware) and have shown how savings could be made in connectivity costs (as in Kyrgyzstan, where the government was able to save US$200,00 per year in their ITU connectivity costs), https://www.projectconnect.world/.
[103] See https://www.ruralelec.org/.
[104] It is possible that the most-marginalised also experience longer periods of load shedding. See, for instance, Rakotonirainy, R. G., Durbach, I., & Nyirenda, J. (2019). Considering fairness in the load shedding scheduling problem. *ORiON*, *35*(2), 127-144.
[105] See https://rea.gov.ng/energizing-education-programme-2/.

of Guinea's collaboration with the African Development Bank, World Bank and French Development Agency to develop mini-grids for renewable energy.[106]

Most-marginalised communities are often located in areas with limited or no Internet infrastructure. Governments should therefore support alternative connectivity initiatives in these areas based on the availability of resources. Possible solutions, that will vary in terms of context and affordability include:

- Digital squares
- Portable Wi-Fi devices
- Cyber Caravans
- Local area networks
- Wi-Fi hotspots
- Community networks

One such alternative connectivity option is offering digital squares (mobile containers with computers) in locations that are central to the community. Digital Village Squares in India, for example, offers 28 standalone HiWEL stations and 23 stations for digital literacy training using the National Digital Literacy Mission's curriculum in a low resource environment.[107] Another option is providing connectivity through portable Wi-Fi devices. Educators in areas with no connectivity in South Africa, for instance, have been provided with Wi-Fi Dongles (pocket Wi-Fi or mobile Wi-Fi routers), which allowed them to conduct teaching and student support remotely.

Cyber Caravans, which are often equipped with computers and broadband Internet connection, represent another connectivity option. The National Computer Board in Mauritius offers specially equipped buses called Cyber Caravans equipped with devices and connectivity on board to bring training programs to communities in remote areas.[108] Another alternative option is community networks that are built by a community for the community. When a government's resources are limited, it can encourage local communities to build their own network. Zenzeleni community network in South Africa, for instance, has been providing a solar-powered Wi-Fi network to the homes of over 3000 people and 3 schools in an underserved community since 2012.[109]

When considering these alternative connectivity options, governments first need to select the best choice in terms of affordability of options and cost-effectiveness (see Section 14 on financing). Alternatives, for example, may include learners' homes, public spaces such as libraries, digital squares, and Wi-Fi hotspots and community facilities such as community halls and Internet cafes. The availability of electricity and Internet, as well as the availability of devices for teachers and learners are some of the determinant factors to decide on which new learning environments to opt for.

Governments can then develop an action plan for distance learning with respect to the level of connectivity in a given area. Where there is no Internet connectivity, for instance, broadcasting classes through radio/TV as mentioned above is a quick way

[106] See https://africabusinesscommunities.com/news/african-development-bank-offers-technical-assistance-for-development-of-mini-green-energy-grids-in-guinea/.
[107] See http://1worldconnected.org/case-study/digital-village-squares/.
[108] See http://www.ncb.mu/English/EPowering-People/Caravan/Pages/default.aspx.
[109] See https://zenzeleni.net/.

to continue learning activities during pandemic conditions. This can be particularly effective when interactivity between learners and the broadcast channel is made possible through alternative technologies such as mobile phones. Where there is limited connectivity, schools can also hold asynchronous classes on devices and mobile phones. In these circumstances, the use of caching options that enable updated content to be downloaded when connectivity permits are also useful.[110] Projects such as WiderNet have, for example, implemented eGranary caching servers[111] with Wi-Fi networks that provide access to Terabytes of curated webpages suited to the students' curriculums. These servers can be updated through slow internet connections during low usage times or by exchanging the caching disk drives occasionally. Likewise content sharing through basic USB sticks is an easy way to help overcome lack of Internet connectivity, although sound security systems need to be in place to limit the spread of digital viruses through shared sticks. There are also several other practices used by local initiatives in areas with limited or no network. Zaya Learning Labs in India,[112] for example, developed ClassCloud, a device that creates a powerful Wi-Fi network for areas with limited or no network and that includes apps for teachers, students, parents, and administrators and pre-loaded with educational content and assessments. Where there is full connectivity, classes can be delivered online if other requirements for teachers and learners are also met (including devices), and particularly if funding ca be made available so that all learners can have access.

In summary:

- No Internet connectivity: Broadcasting classes through television and radio, printing and distributing class material in paper or digital format
- Limited/Unreliable Internet connectivity: Asynchronous classes using mobile phones or devices
- Full Internet connectivity: Broadcasting videos through websites/portals/social media

The precise options chosen will also depend on the availability and affordability of devices (see also Section 10.3). Thus, where Internet connectivity is available, but people cannot afford to access it, radio or TV may be a better option.

Governments, together with service providers, must also agree on and ensure that bandwidth standards are maintained during periods of high demand. Resilient infrastructure should handle sudden changes, and this would be determined by the ability of Internet Service Providers handling an increase in bandwidth demand. If bandwidth standards are not maintained during periods of high use, it would not be able to support learning activities. For instance, Pohnpei Catholic School in Micronesia, which aimed to connect 370 students and 15 teachers through Wi-Fi hotspots failed to do so due to limited bandwidth.[113]

[110] See, for example, https://learningequality.org or https://www.kiwix.org.
[111] See http://www.widernet.org/eGranary.
[112] See https://www.zaya.in/.
[113] Case study available at: http://1worldconnected.org/case-study/pohnpei-catholic-school-project/

10.3 Creating innovative opportunities for achieving access for the most-marginalised

The most marginalised groups often have unique challenges to access and use of the Internet. Some of the most pressing challenges exacerbated by COVID-19 have included access to electricity, access to affordable Internet, access to devices, low levels of digital literacy, lack of local content, concerns around safety and security, and social norms:

- Access to electricity
- Access to affordable Internet
- Access to devices
- Low levels of digital literacy
- Lack of local content
- Concerns around safety and security
- Social norms

One of the main challenges in providing access for the most-marginalised is lack of access to electricity (see also Guidance Note on electricity). In Uganda, for example, only about 8% of the rural population has access to electricity, and even fewer can afford it. This means that any technology solution must be self-powering and self-contained. Using efficient netbooks and solar power, Maendeleo Foundation, for example, has developed solar-powered tablets and solar computer labs to make it possible for schools and communities to access computers and reached nearly 100 schools.[114]

Besides electricity, access to affordable Internet is another very significant challenge. Connectivity may be available, but it can also be too expensive for people to use, especially for transferring large amounts of data. The costs of data bundles and/or cost of access to devices remain prohibitively expensive for a large number of marginalised users. This helps to explain why apps such as WhatsApp which uses limited data (and for which there are sometimes free data offers) have become such a preferred option in much of Africa. To ensure inclusivity, governments need to explore further ways to provide free or very low-cost Internet access to students. In South Africa, for instance, universities after negotiating with mobile operators have provided 30GB of data to students.[115] Alternative arrangements can be made with mobile network operators to zero-rated education services. Such schemes combining the interests of governments and private sector companies need to be made much more widespread if the most marginalised are to be able to benefit from the use of digital technologies for learning.

Lack of access to devices is another key challenge for the most marginalised groups. One of the most common practices to address this challenge is partnering with anchor institutions such as libraries to allow learners to access devices. The Beyond Access initiative, for instance, focuses on strengthening the social power of public and community libraries around the world.[116] By drawing on libraries' pre-existing institutional and infrastructural capabilities, the initiative introduces long-term

[114] See https://maendeleofoundation.org/.
[115] It is still unclear how much data is sufficient for online learning and reports have demonstrated that children used data for non-school related activities depleting the data allocated to them.
[116] See https://beyondaccess.net/.

programs to meet the device, connectivity, and digital skills training needs of the communities. Cyber Caravans equipped with computers and broadband Internet connection, as mentioned above, also offer an alternative way to allow the most-marginalised communities to access the Internet with devices. During COVID-19, some institutions have provided students with devices at no cost, while others have offered loans with payment options.

Apart from devices, low levels of digital literacy present another access challenge among marginalised communities. Basic internet knowledge is necessary for students and teachers to use the Internet and devices for learning activities. However, a large number of marginalised people lack basic working knowledge of the Internet and computers. To address this challenge, governments need to integrate ICT classes into their national curriculum and focus on basic digital skills. During school closures, additional digital skills training opportunities can be offered through mobile phone applications or libraries.

Moreover, lack of relevant local content in digital platforms is a challenge for non-majority-language-speaking students to access educational resources such as schoolbooks, exercises, and activities (see Section 11.5). This is even more challenging in countries where there are multiple local languages and fewer resources to develop local content in multiple languages. Governments can support initiatives such as the Asia Foundation's Let's Read,[117] which builds an unprecedented digital library of local language children's books while cultivating a sustainable network of book creators and translators who are committed to creating meaningful reading opportunities. Likewise, the Madrasa.org initiative launched in 2017 has provided more than 5,000 educational videos in Arabic for learners across the Arab world.[118] Creating OER repositories that allow teachers to share local language teaching materials can enable broader sharing of content.

Furthermore, girls face additional access challenges due to safety and security, gender roles, and socio-cultural norms that expect them to undertake household responsibilities and limit their access to Internet and devices (see Guidance note on Girls' education). As a result, girls in certain cultures may not have the same opportunities as boys to learn and work on their school activities. Existing initiatives suggest that targeted awareness campaigns to bring awareness to gatekeepers such as parents and community leaders can change such practices. Rwanda's Digital Ambassadors Programme, for example, has established female-only Citizen Digital Community Clubs.[119] This programme offered a safe space for women to engage in continuous peer-to-peer learning and share devices to practise their newly acquired digital skills. Another initiative from which lessons can be learnt is the Asikana network in Zambia, which aims to empower girls in schools, colleges, and graduates as well as women in the IT sector.

[117] See https://asiafoundation.org/publication/lets-read/.
[118] https://madrasa.org/who.
[119] See https://www.dotrust.org/media/2019/06/2019-01-04-DAP-Proof-of-Concept-Final-Evaluation-Executive-Summary.pdf.

10.4 Crafting infrastructures for lifelong and lifewide learning

Governments should provide resilient infrastructures that can respond better to changing social, economic, technological, and educational needs, especially in crisis contexts. This is especially evident in the responses to the COVID-19 pandemic, and a systems approach can ensure that education fits appropriately into the wider national architecture. Open standards can be selected and implemented to ensure that the technological platforms can be scaled to include other educational applications and extended to include additional services (see Guidance Note on OER). The system should be designed to be used in all schools, with training and support designed accordingly. It must also be capable of addressing education beyond schools.

Technical infrastructures should be built and designed around considerations of long-term sustainability, including the use of Open Source software and alignment with national education systems. Use of the programme should be institutionalised through the practices of teachers and school administrators, ensuring a level of organizational sustainability. To achieve this, governments should develop sustainable financing models to fund such infrastructure through the use of Universal Service Funds (where available) and multi-sector partnerships (see Section 14).

Governments should also build systems that support data-driven practices for effective management of distance-learning programmes. Technical infrastructure can be developed to manage aggregate data reporting for routine monitoring and evaluation of the programme and to compare outcomes with performance indicators, such as student engagement and performance. Usage data can be collated regularly for summative assessment to ensure that educational decisions are informed by data on the development of the system. This allows schools and governments constantly to improve their distance-learning programs.

Privacy and security are of primary concern (see also Section 13), and infrastructure provision must also address these concerns. The system should protect data at several levels, including physical access to the hardware, encryption of data and the use of certificates. The long-term use of and dependency on the Internet for learning must be supported by robust cybersecurity mechanisms that ensure secure online environments. An overarching educational security policy should be developed and implemented by the national department of education.

Governments can build appropriate technical infrastructure based on existing initiatives some of which are mentioned in this report, and benefit from the considerable software development effort and investment that can generate the development of software tools and standards. This can also lower the costs and risk associated with software systems development. In addition, by using existing open tools, governments can contribute to the continued growth and development of these as a global good of open architecture education informatics tools that can be deployed in other low-resource settings.

Successfully building resilient infrastructures that can respond better to changing needs requires collaboration with different stakeholders and identification of clear roles (see Section 9.3 and Guidance Note on partnerships). Governments can lead on these initiatives through spectrum policy reforms such as South Africa's

expedited spectrum auction and Colombia's proposed spectrum policy. Mobile operators can support with OPEX and CAPEX, while anchor institutions such as libraries can contribute towards access to connectivity, devices, teacher and parental support, and tutoring. Furthermore, the technical community can play a critical role in providing technical support for connectivity problems of schools and households. International NGOs can also contribute to the development of local content, curriculum, and distribution of resources and teaching materials.

10.5 Leveraging global infrastructure initiatives involving the private sector and civil society

Governments must also leverage global infrastructure initiatives to accelerate the development of their connectivity infrastructure. Several global infrastructure initiatives have been developed by the public and private sectors that governments can learn from and/or partner with. Countries in Africa can thus leverage on the Programme for Infrastructure Development in Africa (PIDA)[120] which is a continent-wide programme to develop a vision, policies, strategies and a programme for the development of priority regional and continental infrastructure in transport, energy, trans-boundary water and ICT.

Another global initiative is GIGA, which is led by the ITU and UNICEF, and aims to connect every school to the Internet through combining the expertise and resources of UN agencies, the private sector, international NGOs, and other organisations.[121] To achieve that goal, it is identifying the connectivity gaps in schools around the world, suggesting technical solutions to provide school connectivity, and affordable and sustainable country-specific models for finance and delivery, as well as identifying, localising, and implementing appropriate Digital Public Goods at scale in partnership with governments. It must, though, be remembered that using digital technologies to provide effective learning for the most marginalised goes well beyond merely providing connectivity to schools, and must deliver on the needs of the millions across the world who still do not go to school.

In addition, there are international technology companies that aim to tackle the global connectivity challenges. Through local partnerships, Facebook has thus deployed fibre in South Africa and Nigeria, and Wi-Fi technology on Goree island in Senegal.[122] The Microsoft Airband Initiative[123] has likewise developed a strategic approach that brings together private and public-sector organizations to make affordable broadband available for millions of people who lack access to broadband. Besides the rural U.S., they have operations in many countries in Africa (including Ghana and Kenya) and South Asia (as in India). In Eastern Ghana, for instance, Bluetown[124] is delivering affordable broadband to over 800,000 people in rural areas to enable schools to access digital services. Using low-cost technologies, Mawingu Networks in Kenya connects people to the internet for as little as one dollar per

[120] https://www.afdb.org/en/topics-and-sectors/initiatives-partnerships/programme-for-infrastructure-development-in-africa-pida
[121] See https://gigaconnect.org/.
[122] See https://connectivity.fb.com/network-investments/.
[123] See https://www.microsoft.com/en-us/corporate-responsibility/airband.
[124] See https://bluetown.com/.

month.[125] BRCK, also based in Kenya, is likewise aiming to make the Internet accessible at as low a cost as possible across Africa, and is focusing especially on using it to deliver appropriate educational resources.[126]

At more local levels, governments can also leverage other existing connectivity initiatives that target other development dimensions. For example, while the MOSMAC initiative in Beitbridge, Zimbabwe targeted smallholder farmers, it was also successfully adopted for teaching school children.[127]

Above all, it must be remembered that governments committed to equity and inclusion need to ensure that introducing digital technologies does not further marginalise those who are already disadvantaged. A key principle that needs to be followed is that alternative means of providing educational content and learning opportunities should always be made available to those without access to, or unable to afford, use digital technologies. It can be expensive to maintain such dual systems, and it is often better in the short-term for governments to forego expensive investment in the latest digital technologies in public education systems, and ensure instead that all learners can have an enhanced level of learning opportunities through investing instead in the enhanced use of existing systems (see also Section 14).

[125] See https://www.mawingunetworks.com/.
[126] See https://www.brck.com/.
[127] Gwaka, L.T. (2019) Digital infrastructure and food systems in rural communities of Zimbabwe, PhD thesis, University of the Western Cape; see also Rey-Moreno, C. (2015) Community Telco: an acceptable solution for providing affordable communications in rural areas of South Africa, PhD thesis, Universidad Rey Juan Carlos, DOI: 10.13140/RG.2.2.35722.06083. ·

11 Being context specific: technologies and content

The central argument of this section is that "one size does not fit all" when using digital technologies in support of education. This is especially true when working in support of the least privileged and most marginalised members of any society. Experiences from the COVID-19 pandemic have thus served to reinforce appreciation of the considerable variability that exists in learning outcomes from the use of digital technologies between the richer and poorer members of many societies. Context matters, not only in terms of the technologies used, but also the content to which these digital technologies provide access and the means through which learners and teacher-facilitators interact with each other. It is also important for governments to be clear about the level at which decisions are made with respect to the use of digital technologies in the education system. In some countries this is largely devolved to local authorities or even individual schools, whereas in others this process is much more centralised. There are advantages and disadvantages to both, but in countries with greater diversity it can be more important for these choices to be made locally, where the people deciding know better what kinds of digital technologies are feasible in their contexts. The decentralisation of decision making is an option that should certainly be considered when it is especially important for diversity and local context to be prioritised in choices around types of technology and content.

Five interconnected and important elements are required for such a "context specific" approach:

1. Understanding the contexts of marginalisation
2. Being technology agnostic: balancing old and future technologies
3. Using appropriate devices
4. Developing a relevant curriculum
5. Ensuring appropriate content and platforms for learning

These are particularly supported by specific Guidance Notes on the following:

- Girls' education
- Local content
- People with disabilities
- Refugees and displaced persons
- Sharing Open Educational Resources (OER) with Creative Commons (CC) open licenses
- Small Island Developing States (SIDS)

11.1 Understanding the contexts of marginalisation

Part I emphasised that marginalisation is a process through which people are excluded from access to resources and opportunities, albeit often unconsciously. The most excluded are those who remain completely unseen and unheard. However, Part I also noted seven particular groups that have become increasingly recognised as being of particular significance, and for whom specific and focused educational actions making use of digital technologies should be taken: out-of-school youth, those with disabilities (see separate Guidance Note), girls and women (see separate Guidance Note), refugees and displaced persons (see separate Guidance Note), ethnic minorities and indigenous peoples, those in isolated areas (see SIDS Guidance Note), and those in informal or irregular employment (see training for employment Guidance Note). As noted previously, people in these groups not only tend to be marginalised in terms of education, but also in their access to and use of digital technology. There is therefore a double challenge to be faced in enabling them to use digital technologies appropriately in support of their learning. This has been especially so during COVID-19 when marginalised communities have often been further marginalised because of the actions of governments in response to the pandemic.

In broad terms, it is helpful to understand marginalisation in two main ways: spatial; and social, economic, or cultural. First, spatial marginalisation primarily refers to the places where people live, as in isolated mountainous regions or expansive desert and semi-arid regions, where population densities are low and it is challenging to provide both digital technologies and services, such as education. However, spatial marginalisation can also apply at the micro-scale, as with children in wheelchairs being unable to go up the steps into a classroom, or menstruating teenage girls not wanting to go to school because there are no appropriate sanitary facilities. Second, social, economic and cultural marginalisation occurs between different classes, between dominant groups and refugees or migrant labour, between those in the formal and informal economies, and between those from different cultural or ethnic backgrounds. It is often invisible, and it is all too frequently unaccounted for when people are designing systems to use digital technologies in education. COVID-19 nevertheless brought many of these less visible inequalities to light, as in the case of migrant labour in India,[128] and people with disabilities across the world.[129]

Once the political will has been determined to provide education for all, the first stage for a government in resolving the challenges of marginalisation is to identify the particular character of marginalisation in its polity. For one country, it might primarily be the result of a substantial influx of refugees; for another it might be the deep-seated cultural power of patriarchy; for yet another, it might be its dissected mountain terrain which makes infrastructure provision difficult and expensive. However, used wisely and in a focused and targeted manner, digital technologies can indeed be used to help provide educational benefits in all such contexts. The fundamental point to remember is that no one technology will provide the optimal solution for everyone. A good rule of thumb is that what might work for the ruling elite in the capital city is highly unlikely

[128] Patel, C. (2020) COVID-19: the hidden majority in India's migration crisis, Chatham House, https://www.chathamhouse.org/expert/comment/covid-19-hidden-majority-indias-migration-crisis.
[129] See International Disability Alliance (2020) COVID 19 and the disability movement, https://www.internationaldisabilityalliance.org/content/covid-19-and-disability-movement.

to serve the needs of the poorest and most marginalised citizens, be they living far away in a distant rural part of the country, or almost next-door in an urban slum.

11.2 Being technology agnostic: balancing old and future technologies

It is crucial to ensure that the appropriate technologies are used to deliver the optimal services for any specific context. This applies as much to the financial context as it does to the particular geographical or social context. Put simply, there is little point in spending very large sums of taxpayers' money on the latest, and usually most expensive technologies, when more established and cheaper technologies may well deliver closely similar educational outcomes at a fraction of the cost, and especially for those who are marginalised. This certainly does not mean that poor and marginalised people should have poor technologies and limited educational opportunities, but it does mean that much can be achieved through utilising older technologies in new ways. Moreover, such an approach can also help identify significant gaps where innovative technological solutions can be developed to solve a small problem that can have a big impact on learning.

It is very important for governments to be technology agnostic. This means that they should not place all of their investments into one particular kind or model of technology, but instead set educational objectives and then explore ways of providing the optimal technological solutions in different contexts, preferably in partnerships with private sector companies and civil society organisations. For example, there is no point in giving every child a tablet device if they cannot all access or afford the infrastructure necessary to use them effectively in the classroom and at home. As discussed above in Section 9.1 this would not lead to equity in education. For some people, older technologies such as radio or TV may well be the optimal means through which they can gain access to useful learning resources (see Section 11.3). However, it is very important for governments to ensure that they have in place clear and comprehensive plans to socialise the use of these technologies actually for educational purposes. Looking to the future as well, investing heavily in one particular type of technology, such as low-specification ADSL[130] or "fibre to the school", may not be wise when new generations of satellites come on stream that can provide fast universal connectivity at more affordable prices. Governments should focus on the educational requirements, and remain flexible to adopt whatever new technologies are most appropriate to achieve these objectives.

One means of doing so is to insist as far as possible on universal inclusion in the design of specific technologies and solutions for education.[131] If a piece of technology does not aim to provide a benefit for everyone, it will perforce be divisive and serve the interests of some, usually a privileged few, over the many. Universal inclusion is a principle often associated with ensuring that people with disabilities can access digital technologies (see Guidance Note on the use of digital technologies by

[130] ADSL (Asymetric Digital Subscriber Line) is a data communication technology that enables faster transmission over copper lines than provided by a basic conventional modem.
[131] Some might find the Principles for Digital Development originally developed in the mid-2010s (https://digitalprinciples.org/about/) to be helpful in this context; others might find them too constraining, and reflecting one particular model of "development".

people with disabilities).[132] If technologies are not, for example, designed to be readily usable by the blind, the deaf, and people with physical disabilities, then they will serve further to marginalise them, since those with disabilities will usually need to purchase additional assistive technologies to help them have access to what others take as normal and for granted. However, this "universal inclusion" principle can be extended much further in the context of using digital technologies for education, in that governments could choose to evaluate whether a new technology being recommended for a particular educational outcome does indeed serve all of its main groups of marginalised people, and if not they should reject it in favour of technologies that do.

A final issue to be addressed under the heading of being technology agnostic is the importance that governments must pay to the total cost of ownership of any digital technologies being used in education systems. All too often governments see expenditure on digital technology as a one-off. Not only do many fail sufficiently to take into consideration the full capital expenditure (CAPEX) and operational expenditure (OPEX) required over the short-term duration of a project, but they also frequently omit the long-term costs of upgrading systems as new technologies are introduced. In part this is a result of an emphasis on short-term novel projects but it is also a failure truly to understand the implications of using digital technologies in and for education. This is particularly critical during the COVID-19 pandemic because of the strong political pressure to act fast which has increased the potential for governments to make big decisions to purchase digital technologies without sufficiently taking these factors into account. If "educational technology" projects are not designed to be sustainable at scale from the very beginning, they are rarely likely to be able to go to scale or be sustainable in the future.

It is very important for governments to be technology agnostic. This means that they should not place all of their investments into one particular kind or model of technology, but instead set educational objectives and then explore ways of providing the optimal technological solutions in different contexts, preferably in partnerships with private sector companies and civil society organisations.

11.3 Using appropriate devices

Devices are the means through which learners access information or content. A book is therefore in a sense a device, but digital devices in the context of education are more usually considered to be smart-phones, tablets, laptops or desktop computers. Yet radios, televisions and basic feature phones are also very important devices that can continue to enable people to access information and thereby to learn.

[132] See W3C Web Accessibility Initiative (no date) Accessibility, usability and inclusion, https://www.w3.org/WAI/fundamentals/accessibility-usability-inclusion/; Vosloo, S. (2018) *Designing Inclusive Digital Solutions and Developing Digital Skills*, Paris: UNESCO with Pearson, https://unesdoc.unesco.org/ark:/48223/pf0000265537; UNESCO, European Agency for Special Needs and Inclusive Education, G3ict (2014) *Model Policy for Inclusive ICTs in Education for Persons with Disabilities*, Paris: UNESCO; G3ict and ITU (2014) *Model ICT Accessibility Policy Report*, Geneva: ITU; Broadband Commission (2013) *The ICT Opportunity for a Disability-Inclusive Development Framework*, Geneva: ITU.

At this point in the Report it is worth reiterating that its focus is mainly on how digital technologies can be used appropriately by the most marginalised to access education systems. It is also worth remembering some basic statistics: 46.4% of the world's population were not using the Internet at the end of 2019; and 51% did not use smart-phones.[133] Radio remains the most widely globally consumed medium, with more than three-quarters of households in "developing countries" having access to a radio.[134] Moreover, local community radio remains a crucial source of information and education in many countries such as Bangladesh, where the Bangladesh NGOs Network for Radio and Communication (BNNRC) has played an important role in sharing information, and also representing the voices of otherwise voiceless rural people.[135]

Radio and TV networks are very widely accessible in most countries of the world, and are therefore one of the easiest means through which the poorest and most marginalised people can receive educational content.[136] Although not everyone may own a radio or TV, many more have access to these technologies, not least in communal settings such as markets or tea shops. In 2012, UNESCO thus noted that at least 75% of households in developing countries had access to a radio.[137] COVID-19 has highlighted their considerable continued importance for learning, with many countries having broadcast new educational programmes on both public radio and TV for those unable to attend school and wishing to learn from home.[138] These very same devices and programme can also be used for learning by those who never attended school in the first place. Governments therefore need to draw on these experiences from COVID-19 lockdowns, and explore further ways through which they can use radio[139] and TV much more effectively to reach the unreached with learning content at all levels from primary school to vocational training and lifelong learning.[140] Much can also be learnt from the experiences of companies and civil society organisations that

[133] Sources: ITU (2020) https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx, Statista (2020) https://www.statista.com/statistics/330695/number-of-smartphone-users-worldwide/

[134] Figure from 2013 by UNESCO, http://www.unesco.org/new/en/unesco/events/prizes-and-celebrations/celebrations/international-days/world-radio-day-2013/statistics-on-radio/; more recent global figures are difficult to confirm, but in 2019 the UN Secretary General confirmed that radio reaches more people than any other medium https://news.un.org/en/story/2019/02/1032591.

[135] Bangladesh NGOs Network for Radio and Communication, https://bnnrc.net/.

[136] The importance and potential of Interactive Radio Instruction (IRI) where learners and teachers/facilitators respond to prompts during a radio broadcast interactively is long established (see Trucano, M. (2010) Interactive Radio Instruction: a successful permanent pilot project?, *World Bank Blogs*, https://blogs.worldbank.org/edutech/iri). However, with the increasingly widespread adoption of mobile devices, new forms of IRI have emerged through which listeners can communicate with each other and broadcasters by mobile device during a radio broadcast. See also UNESCO (2018) *World Trends in Freedom of Expression and Media Development*, 2017/2018, Paris: UNESCO and University of Oxford, https://unesdoc.unesco.org/ark:/48223/pf0000261065.

[137] UNESCO (2012) World radio day, http://www.unesco.org/new/en/unesco/events/prizes-and-celebrations/celebrations/international-days/world-radio-day-2013/statistics-on-radio/.

[138] World Bank (2020) How countries are using edtech (including online learning, radio, television, texting) to support access to remote learning during the COVID-19 pandemic, https://www.worldbank.org/en/topic/edutech/brief/how-countries-are-using-edtech-to-support-remote-learning-during-the-covid-19-pandemic; see also Watson, J. and McIntyre, N. (2020) Rapid evidence review: educational television, EdTechHub, https://edtechhub.org/wp-content/uploads/2020/07/RER-TV.pdf.

[139] Damani, K. and Mitchell, J. (2020) *Rapid Evidence Review: Radio*, EdTech Hub, https://edtechhub.org/wp-content/uploads/2020/07/Rapid-Evidence-Review_-Radio.pdf.

[140] See also Williamson, B. (2019) New power networks in educational technology, *Learning, Media and Technology*, 44(4): 395-398.

have long worked with radio and television edutainment to help people of all ages gain a better education. Mediae in Kenya, for example, has been working for more than 20 years delivering TV drama series such as Makutano Junction, set in a typical peri-urban settlement in East Africa. In this period it has reached more than 25 million people, many of whom have been among the poorest and most marginalised citizens in their countries.[141] It has also created Kenya's first education TV programme for children called KnowZone, focusing on improving their mathematics, English language and science understanding and skills.[142] Importantly, this is explicitly designed to link closely with the Kenyan curriculum, so that it not only provides a supplement for those in school, but it also provides learning opportunities for those who do not have a smart-phone with access to the Internet and are unable to attend school for whatever reason.

In providing education for all, it is therefore essential for governments to begin by understanding what digital technologies and devices the most marginalised have access to and are already using. Starting with these it is then possible to provide basic educational resources to many more people than just those in school. Subsequently, more tailored and specific programmes can be developed using newer technologies and devices where appropriate to deliver more advanced levels of interactive learning for them.

11.4 Developing a relevant curriculum

It is not enough for poor and marginalised people and communities to have effective and reliable connectivity and devices. They also need a context appropriate curriculum and relevant and accessible content (see also pedagogy in Section 12). Broader aspects of curriculum reform go beyond the remit of this report, but it remains important to emphasise the linkages between digital technologies and curriculum design. In particular the curriculum must be appropriate for the learning needs of children and adults in a world that is becoming increasingly dominated by digital technologies, but it must at the same time also recognise the potential that these new technologies have for enhancing the effective delivery of a national curriculum.

In general terms, it is essential that any legislated education policy and curriculum is explicitly designed to be relevant to the needs of a country as a whole. As argued elsewhere in this report (Sections 8 and 9) this needs to involve a whole society approach that engages with private sector companies, civil society organisations, and learners of all ages. The increasing use of new digital technologies and their promotion by the private sector has tended to prioritise the importance of digital skills in curriculum design and content, but this must not be at the expense of other more important dimensions of a broad and relevant curriculum, especially such aspects as critical thinking, peace building, social responsibilities, cultural values,

[141] See Mediae, https://mediae.org. See also, Watson, J. (2020) Learning through television in low-income contexts: mitigating the impact of coronavirus (COVID-19), https://edtechhub.org/2020/03/31/learning-through-television-in-low-income-contexts-mitigating-the-impact-of-covid-19/; and David, R., Pellini, A., Jordan, K. and Phillips, T. (2020) Education during the COVID-19 crisis: opportunities and constraints of using EdTech in low-income countries, https://edtechhub.org/wp-content/uploads/2020/04/education-during-covid-19-crisis.pdf.

[142] All episodes are freely available and collated at http://www.africaknowledgezone.org, so also available to those who have more advanced digital technologies.

respect for diversity, and other specific skills needed for gainful employment. Indeed, while digital literacy from an early age is important it must not be seen as an end in itself, and a strong argument can instead be made for considering these skills primarily as enablers of other aspects of the curriculum.

Digital technologies can also help introduce more fluidity into curriculum design, providing opportunities for people to learn in more diverse ways and at different stages in their lives. In particular, they can be used to support modular schemes that permit different pathways to certification,[143] and the delivery of the curriculum though varied technologies can also help integrate formal, non-formal and informal learning.[144] This flexibility is often especially important for those marginalised people and communities who find it difficult to learn within the spatially and temporally constrained requirements of formal education systems. A good example of this has been the development of an Alternative Learning System (ALS) through the eSkwela programme in the Philippines which has provided opportunities for out-of-school youth to participate in a non-formal online curriculum that can enable them to complete a different pathway to school certification that then permits them to gain formal employment.[145]

As far as possible, it is important that countries should have a uniform curriculum that is delivered by all of their formal educational establishments, so that when children move from one area to another they can continue their learning uninterrupted. However, where this is not the case, digital technologies can be used effectively to identify and deliver those aspects of a curriculum necessary in one area, but not in another. This is also especially valuable to migrants and refugees, both children and adults, who may well have followed a curriculum in their home areas that is very different from that in their new host country or location (see also Guidance Note on refugees and displaced persons).

A final aspect of the curriculum that has been shown to be of particular importance in the context of the COVID-19 pandemic has been the desirability of having a limited core curriculum available in many different formats and through varying modes of delivery, which can be taught in restricted circumstances such as environmental disasters or pandemics. This might, for example, focus on core elements of a national language, mathematics, culture and science at primary and secondary levels. Governments should therefore ensure that they identify the most important elements of the curriculum, and make resources available for their delivery

[143] User-owned blockchain-based certification schemes, including digital IDs, can provide one approach to this, which may be especially useful for migrants and refugees, although the ethical issues around these still require careful consideration. See also Yoti (https://www.yoti.com/) for an alternative ID model.

[144] In general usage, formal education is delivered by formal institutions such as schools, colleges and universities; non-formal education is more flexible and is delivered by community groups and other civil society organisations; and informal education is gained through wider interpersonal networks and experiences, for example at home or at work. See Eshach, H. (2007) Bridging in-school and out-of-school learning: formal, non-formal, and informal education, *Journal of Science Education and Technology*, 16(2): 171-190, https://link.springer.com/article/10.1007%2Fs10956-006-9027-1.

[145] See Kamei, M. (2010) eSkwela project – eSchool for out of school youths and adults, Philippines, *IEEE International Conference on Technology for Education*, DOI: 10.1109/T4E.2010.5550039; Unwin, T., Tan, M and Pauso, K. (2007) The potential of e-Learning to address the needs of out-of-school youth in the Philippines, *Children's Geographies*, 5(4):443-462.

through diverse pathways and digital modalities to enable the most marginalised to continue to learn the most important aspects of the curriculum in such circumstances. There could even be value in relevant UN agencies working together to help develop such a global core curriculum, with relevant resources and OER content under Creative Commons (CC) licensing, that could then be localised in various national contexts.

11.5 Ensuring appropriate content and platforms for learning

Once the infrastructure, devices and curriculum are in place, it is essential for governments to ensure that relevant, high quality digital content is be made available in varying learner- and teacher-friendly formats across diverse platforms and through different technologies. Such diversity will help to ensure resilience.

Governments must have in place national strategies for the delivery of high quality, localised and above all relevant digital content that can enable teacher-facilitators and learners to access materials in support of the curriculum (see local content Guidance Note). This will require mechanisms for the design, production and evaluation of such content. In some instances, core content development may be placed in the hands of national agencies, whereas in other contexts it may be more cost effective to outsource such design and production to external companies or collectives. For too long, though, private sector companies, be they traditional textbook publishers or digital content providers, have treated education primarily as a market from which they can generate profit. Systems where tax revenues are used in effect to enhance company profits do not always guarantee the equity principles outlined earlier in this report. In many countries that offer "free education", for example, parents still have to contribute to the costs of textbooks.[146] Hence, if parents of school children cannot afford to pay for textbooks or digital content, their children are less likely to learn effectively than are the offspring of richer parents who can indeed afford to pay for such content.

Digital technologies provide many alternative opportunities to provide readily available content that is truly free-to-end-user, especially through the use of Open Educational Resources (OER)[147] and open licences provided through Creative Commons (CC)[148] (see Guidance Note on OER and CC). Whilst there remain challenges with developing sustainable business models to support the creation of OER, many countries are moving towards the principle that where public resources are used to fund research or any form of content, such content should be made freely available and accessible to all. An alternative way of ensuring free-to-end-user content is for governments to pay licenses to proprietary producers of content, and then share these resources nationally for free, as with the ambitious Egyptian Knowledge Bank announced in 2016, which was created in partnership with a range

[146] Benavot, A. (2016) How we could triple the availability of textbooks, *World Education Blog*, https://gemreportunesco.wordpress.com/2016/01/19/how-we-could-triple-the-availability-of-textbooks/. See also Global Book Alliance, https://www.globalbookalliance.org/.
[147] See for example UNESCO OER Dynamic Coalition, https://en.unesco.org/themes/building-knowledge-societies/oer/dynamic-coalition, and OER Commons, https://www.oercommons.org/,
[148] Creative Commons, https://creativecommons.org.

of international content providers.[149] It is also essential that government strategies and legislation have in place effective and rigorous systems for evaluating the quality and utility of all content, whether or not made available as OER, to ensure that it is of high quality and also of specific relevance to the needs of its citizens and avoids any tendency towards the imposition of the cultural values, attitudes and economic ideologies of a few powerful states on the education systems of less advantaged others.

Six further issues need to be addressed by governments at the interface between digital technology and content for the most marginalised:

- Digital technologies are especially useful for providing *content in multiple languages*, and can therefore readily be used to enable children and adults to learn in their own languages. An excellent example of what can be achieved with the will and sufficient funding has been the impressive way through which the Madrasa.org platform developed in the UAE[150] has translated existing content, especially from the Khan Academy, into Arabic and made this widely available globally.[151] If other governments had sufficient commitment to equity in learning, they could readily invest similarly in sourcing existing curriculum-relevant digital content in major regional languages, or translating existing content into local languages that are relevant for marginalised communities.
- *Digital content must be relevant to the curriculum*. All too often there is a mismatch between the digital content already available and the requirements of a specific curriculum. Thus, it may not be easy to transport and use existing digital content designed for other countries or cultures directly into the requirements of a curriculum designed to be specific and relevant to the needs of one particular country. Efforts to create small pieces of universal content, so called bite-sized learning (see Section 9.6), that can be translatable from one cultural context to another have not yet proved to be particularly successful. Likewise, attempts to create a universal set of global content that everyone should follow have met with some resistance, despite the efforts of private sector companies and various civil society organisations to promote them. Concerns about the risks of neo-imperialism and the self-interest of entities seeking to create such a curriculum, reflect the continued importance of culture and national identity in shaping curriculum relevant content.
- *Content needs to be made available in diverse formats*. The need for all content to be inclusive and available in diverse formats has long been an issue, especially for people with disabilities. However, COVID-19 has highlighted the importance of ensuring that digital content is not just developed for the latest generation of smart-phone devices, but can also be accessed by those with the least resources. Governments wanting to

[149] EKB, https://www.ekb.eg; mainly created in partnerships with European and North American content providers such as Elsevier https://www.elsevier.com/en-xm/solutions/clinicalkey/egyptian-knowledge-bank, Springer https://www.springernature.com/gp/librarians/landing/ekb, Taylor and Francis https://think.taylorandfrancis.com/egyptian-knowledge-bank/, and Sage https://uk.sagepub.com/en-gb/eur/egyptianknowledgebank.

[150] Madrasa.org developed since 2018 by Mohammed Bin Rashid Al Maktoum Global Initiatives https://madrasa.org/.

[151] The Khan Academy, https://www.khanacademy.org/.

deliver effective learning opportunities for the most marginalised should therefore consider supporting first the development of digital content for the most accessible technologies such as radio and TV, whilst leaving high-end content provision to the private sector who can profit from sales to richer and more privileged segments of society.

- *Not all content can readily be digitised and made available online*. This is particularly a challenge for practical based learning, and especially so for much employment-related training (see Guidance Note). However, with careful design, interactive videos can be used effectively for much practical learning, especially for example when short video clips are used to provide alternative scenarios depending on choices made by the learner. Moreover, improvements in VR and AR are also enabling much more realistic practical learning opportunities available, albeit only for those who are able to afford it.
- *The potential of AI for personalised learning*. Recent developments in Artificial Intelligence (AI) have highlighted the potential for digital technologies to enable learning to become increasingly personalised and tailored to the perceived needs of the individual. This, however, requires the use of considerable amounts of personal data, which gives rise to substantial ethical concerns (see Section 13). It is also dependent on close integration with learning managements systems (LMSs). Moreover, once again such developments are most likely to benefit the already privileged who can afford them, rather than the least privileged and most marginalised. The drivers of such technology are clear: it has been estimated that by 2024 more than 47% of all learning management tools will use AI, and the market size of such AI-enabled learning tools will be more than US$ 6 billion.[152]
- *Digital learning content must also be teacher/facilitator friendly*. Good teachers are also learners (see Section 12). They not only use content to build their own skills and subject understanding, but they also have to help other learners understand and use it likewise. Hence, digital learning content must also be designed bearing in mind how teachers and learning facilitators at whatever level might use it in delivering the curriculum.

These final two points also emphasise the importance of ensuring that appropriate portals and learning management systems are available to facilitate the intellectual exchange between governments, teachers and learners. At the national level, it is essential that governments ensure that there are effective, relevant and appropriate education portals available, either managed by their own ministry or by another entity on behalf of the government.[153] The quality of national portals varies significantly, in part depending on their intended use, but also in terms of the skills and design expertise of those involved in their implementation. Among the most successful that can serve as exemplars are the work of Plan Ceibal[154] developed in Uruguay, and that of the Finnish National Agency for Education.[155] The crucial things about these is that they are indeed accessible and relevant to those working with and

[152] Schmelzer, R. (2019) AI applications in education, *Forbes*, https://www.forbes.com/sites/cognitiveworld/2019/07/12/ai-applications-in-education/.
[153] UNESCO provides a useful overview: UNESCO (2020) National learning platforms and tools, https://en.unesco.org/covid19/educationresponse/nationalresponses.
[154] Plan Ceibal, https://www.ceibal.edu.uy.
[155] Opetushallitus Utbildningsstyrelsen, https://www.oph.fi/fi.

among the most marginalised. Many different LMSs are also available for institutions, both free to use and Open Source such as Moodle[156] (Open Source platform and free to use; originally mainly for universities but now also for schools) or Edmodo[157] (free cloud-based platform), and also proprietary ones such as Blackboard Learn.[158] However, the choice of LMS very much depends on institutional requirements,[159] and financial options. Once again there is no one-size-fits-all platform, although free to use and Open Source solutions are most likely to be preferred in low-resource availability contexts such as those encountered by most marginalised communities.

It is also pertinent to note that UNICEF and Microsoft announced in April 2020 the expansion of the *Learning Passport* as a global portal response to COVID-19, which was an initiative they had originally been developing with the University of Cambridge as a pilot project since 2018.[160] This forms part of their contribution to Generation Unlimited,[161] and is intended to facilitate country-level curriculum access for children and youth whose schools were shut because of the pandemic, as well as providing key resources for teachers and educators, and it consists of a specific educational model for primary education, and a platform of resources. It remains to be seen to what extent such a global vision will be successful, especially given the caveats noted above about neo-imperialist tendencies and interests behind many such initiatives. However, it is one example of attempts to use digital technologies at a global scale to create a portal that will support learning for all.

[156] Moodle, https://moodle.com/.
[157] Edmodo, https://www.edmodo.com/
[158] Blackboard, https://www.blackboard.com/
[159] Fenton, F. (2018) The best (LMS) Learning Management Systems for 2018, *PCMagazine*, https://uk.pcmag.com/education/69852/the-best-lms-learning-management-systems-for-2018
[160] The Learning Passport, https://www.learningpassport.org . Note that Dubai Cares was also a founding partner.
[161] Generation Unlimited, https://www.generationunlimited.org/who-we-are.

12 Appropriate pedagogies: the practices of teaching and learning

1. A whole society approach: delivering equity in education
2. Enabling access for all: building appropriate resilient infrastructures for education
3. Being context specific: technologies and content
4. **Ensuring appropriate pedagogies: the practices of teaching and learning**
5. Making wise use of technology: security, privacy and data

One of the overwhelming outcomes of the COVID-19 pandemic has been the realisation that teachers really do matter. To be sure, it is possible for learners to gain information by themselves,[162] but they do so much more effectively when they are guided by a knowledgeable other person, who is aware of the curriculum and assessment requirements, and can steer learning in an appropriate direction. This applies as much to children of school age as it does to adults learning a new set of skills. However, all too often in the past, the roles of teachers have been marginalised in projects and programmes that have sought to introduce digital technologies into education systems. Teachers have often felt that the technology has been introduced to replace them, and this has indeed sometimes been the case.[163] COVID-19 has therefore presented an excellent opportunity for education systems to be recrafted so that they place excellence in teaching at their heart. To achieve this, the highest priority must be placed on relevant in-service and pre-service teacher training that focuses on enabling teachers and learning facilitators of all kinds to use digital technologies to enhance their own learning and thereby improve the quality of their teaching so that all of their pupils and students have better learning outcomes.

In summary, this section addresses the following six themes:

1. Ensuring appropriate pedagogies
2. Crafting flexible practices
3. Empowering teachers, trainers and facilitators
4. Enabling pathways for learning progression
5. Requiring appropriate assessment schemes
6. Ensuring inclusion for all

These are particularly supported by specific Guidance Notes on the following:

- Involving marginalised young people in the design of their own education
- Local content
- Prioritising effective and appropriate teacher training

[162] Mitra, S. (2020) Children and the Internet: learning, in the times to come, https://www.cevesm.com/article-children-and-the-internet-2

[163] The classic example was the introduction of plasma screens into Ethiopian secondary schools in the mid-2000s. See, for example, Birbirso, D.T. (2013) Technology for empowering or subjugating teachers: analysis of Ethiopia's education reform discourse practice, *Journal for Critical Education Policy Studies*, 11(4): 179-201.

- Refugees and displaced persons
- Sharing Open Educational Resources (OER) with Creative Commons (CC) open licenses
- Uses of digital technologies in support of training for employment

12.1 Ensuring appropriate pedagogies

Governments have a crucial role in ensuring that appropriate pedagogies are in place within their education systems. However, digital technologies are being used to effect fundamental changes in pedagogy, as witnessed during the COVID-19 pandemic. This section therefore provides an overview of these fundamental structural changes, so that governments can help ensure that the pedagogies they advocate are indeed appropriate for learners, and especially the most marginalised.

Pedagogy is essentially concerned with the ways in which teaching and learning happen. It concerns the theory and practice of learning, and how this is not only influenced by, but also influences, all aspects of the development of learners. It is profoundly social, political, cultural and economic, and therefore varies widely in different parts of the world. Traditionally, in most cultures and countries, teachers were seen as being the guardians of what knowledge was seen as valuable within a society and it was their role to impart this to the next generation. This was associated with an essentially *didactic* model of teaching, in which the teacher is seen as an authoritative guide and resource for learners, providing them with a theoretical framework and basic skills so that they can organise their learning. Most usually, this has taken the form of a teacher standing in front of a class imparting knowledge to the pupils, and it often remains the dominant mode of teaching (rather than learning) in many of the economically poorest countries of the world today.

However, such a model was significantly challenged during the second half of the 20th century both theoretically and practically. At a conceptual level, it was criticised primarily because of its authoritarian framing that tended to reinforce existing socio-political structures,[164] and also because of a growing realisation that learning is an active process through which children construct their own knowledges, thereby giving rise to the term *constructivism* as an alternative to previous didactic approaches.[165] Practically, the rapid expansion in the amount of resources available for learning following the invention of the World Wide Web in 1989, and especially with the explosion of information available online over the last decade, has meant that it is impossible for teachers any longer to be seen as the sources of all knowledge (see Guidance Note on involving young people in the design of their own learning).

Nevertheless, traditional didactic models of teaching, with a teacher (or digital screen) at the front of the classroom still remain widespread in many countries. Moreover, in marginalised contexts where children have neither textbooks nor access to the Internet, "knowledgeable" people are still essential to help them learn. Likewise,

[164] Most notably in the work of Paulo Freire who is widely seen as the main founder of critical pedagogy; see Freire, P. (1968) *Pedagogia do Oprimado*, Rio de Janeiro: Paz e Terra.
[165] Widely seen as being derived from Jean Piaget's theory of cognitive development; see for example, Piaget, J. (1950) *La construction du reel chez l'enfant*, Neuchâtel: Delachaux er Niestle.

much informal learning and the practical skills associated with many aspects of vocational training, also require the involvement of an experienced teacher or facilitator. Hence, while a constructivist approach, involving teachers mainly as guides to the plethora of learning resources now available has become increasingly widespread, especially when it is associated with the use of digital technologies, it may not always be optimal, especially in marginalised contexts. Furthermore, such approaches can themselves be criticised as being part of a neo-imperialist agenda to impose a particular kind of learning that primarily serves the interests of global capitalism through which international corporations are the main beneficiaries.

12.2 Crafting flexible practices

An important implication of the above conceptual considerations is that it is essential for education systems to enable flexible practices to be used that combine pedagogies and digital technologies together in optimal ways for different contexts. This is especially so when considering education for the most marginalised, because by definition they have usually been failed by existing education systems and pedagogies, and new and innovative ways are often needed to help people within them learn. This principle lies at the very heart of this Report.

Three main recommendations arise for governments to help ensure that flexible learning environments are crafted.

- First**,** *the technology must match the pedagogy*. One of the very real challenges of COVID-19 has been that many poorly trained teachers have struggled to adapt their teaching approaches to the requirements and potential of an online digital environment. They have not unsurprisingly found it difficult to use digital technologies to teach in the same ways that they have done previously. It is often said that the pedagogy should therefore be changed to match the technology. However, this recommendation has been phrased explicitly in the way that it is to give primacy to the pedagogy, emphasising that technology should be used to support the sort of pedagogy that societies and governments wish to have in place rather than the other way around. Certainly, digital technologies should be used as an integral part of any pedagogical change process, but their use and promotion should not be the prime purpose of the education system.

- Second, *pedagogies and technologies should always be appropriate for the context of learning*. Different pedagogies are often appropriate in different contexts. The ways through which teachers can support learning with nomadic communities are thus very different from what it is possible to achieve in a well-equipped classroom. Governments therefore need to have in place not only an agreed set of minimum standards of infrastructure, devices and content in place to support the desired pedagogy (see Section 10), but also a nuanced set of additional pedagogical requirements to enable the most marginalised to gain access to and benefit from the education system through the use of those technologies that are indeed available and affordable to support them (see Guidance Notes on education

for refugees and displaced persons, for those with disabilities, and local context).

- Third, it is important that *this interplay between pedagogy and technology should be resilient and robust* so that it can continue during periods of disruption caused by pandemics, environmental disasters, or warfare. Provisions need to be made and planned for so that alternatives can be put in place for when teaching practices and technological uses that are possible in "normal" circumstances no longer become feasible. All governments should learn from COVID-19 and put in place clear policies and practices to ensure that alternative learning systems are available when children cannot be educated in schools because of such crises. The beauty of this is that if such practices are maintained and supported on a regular basis they will also be of direct benefit to those children who for whatever reasons are unable normally to attend schools.

12.3 Empowering teachers, trainers and facilitators

Empowering teachers and learning facilitators to be able to use digital technologies effectively is without doubt one of the most important things that governments can do to enhance the appropriate use of such technologies within their education systems (see Guidance Note on teacher training). The experiences of COVID-19 have shown very clearly that in many parts of the world teachers still do not have the expertise to use basic digital technologies effectively, regardless of the pedagogical approached being used. This is often true even in countries with relatively good education systems. In Sri Lanka, for example, many teachers were reported simply to be using WhatsApp during COVID-19 to do what they used to do on blackboards in the classroom.

Five core areas require sustained attention if teachers, trainers and learning-facilitators are to be able to use digital technologies effectively, and be empowered through such usage:

- *Effective and relevant pre- and in-service teacher training* is essential for all education systems.[166] However, this must go beyond simply teaching teachers how to use digital technologies,[167] and needs to be focused on how teachers can use existing and newly available technologies better to deliver the relevant curriculum. This needs to be embedded in all teacher training institutions and must be matched with effective continual professional development and in-

[166] See UNICEF's (2020) *Emergency Manual for Teachers*, available on the LearnIn Wiki https://learnin.wiki/en/Workstream/emergency-manual/emergency-manual-overview for one response to the COVID-19 pandemic.

[167] In the early days of incorporating digital technologies into schools in the 2000s, many companies such as Microsoft (https://docs.microsoft.com/en-us/learn/) and Intel (see https://www.intel.co.uk/content/www/uk/en/education/k12/teach-elements.html) provided training for teachers, but in most instances this focused largely on simply giving them the skills to use "Office" type software. These training programmes have now moved well beyond this, but such past practices served to establish the widespread notion that teacher training in digital technology was more about learning to use the technology, which was always based on business packages, rather than learning to used digital technologies actually in teaching. It is no coincidence that such packages were terms "office" rather than "teach" or "classroom".

service training. This can also usefully involve coaching schemes for teachers. Distance based training enabled by appropriate use of online learning can play a powerful role in upgrading teachers' skills, especially when combined with incentives such as certification and salary increases for teachers who use such technology to improve the quality of pupil learning. UNESCO's ICT Competency Framework for Teachers provides comprehensive guidance for governments wishing to establish such frameworks in their own countries (see Guidance Note on teacher training).[168]

- *Teaching through digital technologies*. COVID-19 has clearly reminded people that learning online is not the same as teaching in a classroom. However, it must also be realised that appropriate use of digital technologies within the classroom is also very different from traditional didactic modes of teaching.[169] When pupils cannot attend school or college, teachers have the added role of encouraging them to learn for themselves, manage their time, retain social learning networks, and remain safe (see Section 13). Appropriate digital technologies can support all of these, but they should be seen primarily as enhancements to good practices within the classroom, in which the role of teachers should primarily be as guides to help young people manage their own critical explorations of the wealth of information and content now available online. Good digital technologies help students to learn from high quality multi-media content and games, and also to participate in peer-learning networks.
- *Involving school leaders and administrators*. Good learning practices using digital technologies in schools and colleges cannot be achieved without the leadership of school principals and the support of school administrative personnel. School leaders and administrators require effective digital learning management and administration systems, and they need to be trained in the appropriate use of such systems, just as much as do teachers. All too often, though, the one computer or laptop in a school is kept hidden away, unused, in the head teacher's office, because it is "too precious" for other teachers, let alone children, to use. Although such practices are changing, this remains the reality on the ground in many of the economically poorest countries. It is therefore equally important for governments not just to invest in training teachers, but they should also ensure that school leaders and administrators are trained and supported to use these technologies.
- *Governments must ensure that sufficient support for teachers is available*. Building teacher self-confidence and the prestige with which they are held in society is one of the most important factors in ensuring effective education systems and enhanced learning outcomes.[170] In Finland, for example, teaching is the most admired profession, and primary school teaching is the most sought-after career.[171] This has a clear impact on the quality of teaching, and thus the

[168] UNESCO (2018) *UNESCO ICT Competency Framework for Teachers*, Paris: UNESCO, p.7, https://www.open.edu/openlearncreate/pluginfile.php/306820/mod_resource/content/2/UNESCO%20ICT%20Competency%20Framework%20V3.pdf

[169] For examples from Lebanon, see: Burns, M. (2011) *Technology Teaching and Learning: Research, Experience & Global Lessons Learned*, Beirut: Education Development Centre; and Digital Opportunity Trust (2015) D-Rasati2: Developing rehabilitation assistance to schools and teacher improvement, Washington, DC: USAID.

[170] See Saha, L.J. and Dworkin, A.G. (2009) *International Handbook of Research on Teachers and Teaching*, New York: Springer.

[171] Center on International Education Benchmarking (2019) Finland: Teacher and Principal Quality, Washington, DC: National Center on Education and the Economy, https://ncee.org/what-we-

learning outcomes of students; it is a virtuous circle of improvement. Although this is far removed from the experiences in most other countries, all governments can do much to raise the prestige of teaching as a profession. One way of doing this is to support teachers' digital access, especially in crisis contexts. The provision of free devices and access to the Internet are essential in contexts where teachers are poorly paid and yet also expected to teach online during pandemics when schools are closed. Governments can also establish online call centres to provide technical support for teachers via text, chat, e-mail or telephone. This is an area where the private sector can also play a significant role, simply by offering teachers free connectivity during periods of lockdown. Low-interest loans and subsidised connectivity for teachers can also make a huge difference in "normal" times as well.

- *Working with learning facilitators*. Many people other than trained teachers support learning throughout the world, from grandparents, parents and siblings, to classroom assistants, informal learning facilitators and vocational training mentors. Few countries, though, have in place formal mechanisms to involve and support such roles and individuals. One feature of COVID-19 has been the increasing emphasis being placed on online communication between teachers and families in supporting children's learning. Experiences from the appropriate use of digital technologies in supporting communication between schools and parents under normal circumstances are invaluable in crisis contexts, and should be more widely shared, especially with respect to the risks and challenges involved.[172] More broadly, though, governments need to consider establishing and supporting ways through which all those involved in teaching or otherwise supporting learning, can themselves gain the necessary knowledge and expertise required in their roles through existing national education portals. The role of community volunteers in helping people learn is also very important, as for example illustrated by the work of Pratham in India, and BRAC in Bangladesh, not only during the COVID-19 outbreak, but also systemically in support of some of the poorest and most marginalised.[173] Community volunteers with the appropriate training can also provide general support to both learners and teachers around such issues as wellness and wellbeing. Once again, digital technologies are particularly important in such contexts, enabling such community volunteers to have access to appropriate resources to share with the learners that they are supporting.

12.4 Enabling pathways for learner progression

Most education systems have clear and formal pathways for learner progression, usually in the format of examinations at what are considered to be key stages in a young person's education.[174] These are generally seen to be of most importance at

do/center-on-international-education-benchmarking/top-performing-countries/finland-overview/finland-teacher-and-principal-quality/.

[172] See, for example, Kuusimäki, A-M., Uusitalo-Malmivaara, L. and Tirri, K. (2019) The role of digital school home communication in teacher well-being, *Frontiers in Psychology*, 14, https://doi.org/10.3389/fpsyg.2019.02257.

[173] Pratham, https://www.pratham.org/about/, and BRAC, http://www.brac.net/.

[174] Field, S. and Guez, A. (2018) *Pathways of Progression: Linking Technical and Vocational Education and Training with Post-Secondary Education*, Paris: UNESCO,

two stages: the completion of basic education between lower and upper secondary levels where systems differentiate in this way; and the transition between secondary and tertiary education.[175] The first of these is often the juncture where young people leave formal education altogether, or decide to enter either further formal vocational or academic training.

Such a system, though, can further marginalise those who are unable to attend school and gain formal qualifications that enable them to progress into particular careers or along specific pathways (see also Section 11.4). Governments therefore need to have in place clear mechanisms through which alternative pathways can be put in place, and learners' progress recorded, that enable those outside the formal education system to continue to learn and gain equivalent qualification. This will be of help in obtaining gainful employment should they so wish. Digital technologies that enable learning portfolios to be developed based on appropriate forms of assessment can be introduced, and there is likewise a growing movement in support of open badges through which learning achievements can be gained and managed.[176]

Such flexible systems are important for all those outside formal education systems, but are especially so for migrants and refugees, who often need to show their credentials in a host country before they can gain formal employment (see Guidance Note on refugees and displaced persons). This requires building a set of globally compatible requirements, standards and pathways, or at the very least regional or bilateral agreements between countries. The use of secure digital systems linked to online identify management offers considerable potential here, although there are considerable security and privacy risks associated with such initiatives (see Section 13).[177]

12.5 Requiring appropriate assessment schemes

The complex field of assessment is closely linked to several other themes of this Report, most notably Section 14 on security, privacy and data, as well as Section 11 on context specificity. Assessment has, for example, significant connections with issues around confidentiality and data protection, and it must also be designed so that it is relevant and pertinent to the context in which it is used. However, it is included in

http://www.unesco.org/new/fileadmin/MULTIMEDIA/FIELD/Beirut/images/Education/LinkingTVETHED.pdf

[175] For detailed ISCED 2011 Classification, see UNESCO Institute for Statistics (2011) *International Standard Classification of Education, ISCED 2011*, Montreal: UIS, https://web.archive.org/web/20130124032233/http://www.uis.unesco.org/Education/Documents/isced-2011-en.pdf.

[176] See, for example: ILO (2020) Policy Brief: distance and online learning during the time of COVID-19, https://www.ilo.org/wcmsp5/groups/public/---ed_emp/---ifp_skills/documents/publication/wcms_743485.pdf; Henson, M. (2017) A beginner's guide to open badges, *eLearning* Industry, https://elearningindustry.com/guide-to-open-badges-beginners; and IMS Global, Open Badges https://openbadges.org/.

[177] See, for example, the Yoti identity management system, which unlike many others seeks to enable individuals (rather than institutions) to own their personal digital identity: https://www.yoti.com/; see also World Bank Blogs, Inclusive and trusted digital ID can unlock opportunities for the world's most vulnerable, https://www.worldbank.org/en/news/immersive-story/2019/08/14/inclusive-and-trusted-digital-id-can-unlock-opportunities-for-the-worlds-most-vulnerable, although the ethical implications of some of these initiatives require very careful consideration.

this section primarily because of its close integration with pedagogy; teaching and assessment are intimately intertwined. COVID-19 has thus seen the need for new types of assessment to be introduced in some countries, and cancellations and delays to assessments in others.[178] It is therefore critically important that governments have in place new, robust, fair and resilient assessment systems to enable less disruption to occur in future pandemics or environmental disasters. Digital technologies can contribute much in such challenging circumstances, but they can also play an integral part in the wider changing pedagogies discussed above.

The most important aspects of assessment that governments need to get right are that they do indeed test the skills and knowledge that they purport to, that they are fair, that they are rigorous, that they are secure, and that they relate to the curriculum. This section briefly summarises four main areas where governments can usefully take action to ensure that digital technologies are indeed used appropriately in assessment, focusing mainly on the needs of the most marginalised: identifying the strengths of digital technologies, ensuring that appropriate assessments are used, enabling access to relevant assessments, and facilitating linkages with certification.

Appropriate digital technologies can play a very valuable part in improving assessment systems in general and individual tailored learning in particular. Secure online assessments can indeed make them fairer and introduce greater equity into the education systems, thus potentially benefitting the poorest and most marginalised. However, any account of assessment must clearly differentiate between formative assessment and summative assessment. The former is concerned with monitoring learning so as to provide feedback to the learner. It can, though, also be used by teachers to improve their own skills. Summative assessment, in contrast, evaluates knowledge and skills at the end of a period of learning, and compares these against some standard or benchmark, often so that the learner can gain a certificate as proof of their abilities for employers or another stage of education. ICTs can be used in different ways for both formative and summative learning.

With respect to *formative assessment*, many digital platforms and content delivery mechanisms using digital technologies contain quizzes and tests that can provide an important element of formative assessment for children. Educational games, played either online or through downloaded apps on 'phones, are also a particularly good way for children to test their own understanding of a subject. This can be especially powerful when children may not have access to a school or teachers, as during the COVID-19 pandemic and other crises. A great advantage of automated assessment for learners is that it should always be consistent and accurate. Computers and apps should always show what is deemed to be the correct answer to a question or process, whereas teachers may vary in the grades they give, perhaps because they are tired, bored, or simply do not know the right answer. It is, though, very important that the answers stated as being correct are indeed so, and that the software also provides an explanation where children do not answer correctly so that they can learn from their mistakes.

[178] See, for example, UNESCO (2020) Exams and assessments in COVID-19 crisis: fairness at the centre, https://en.unesco.org/news/exams-and-assessments-covid-19-crisis-fairness-centre.

There is also a distinct advantage for teachers in using automated formative assessment, because it saves them a considerable amount of time in repetitive and at times tedious marking, so that they can actually devote more time to helping and inspiring individual pupils to learn.[179] A good example of this is from China, where digital systems such as WeTrans[180] have been used to help children and adults learn language translation skills by testing them in real time and automatically providing correct answers.[181] This saves teachers a substantial amount of time spent on correcting, it is always accurate, and students can use it over and over again until they get the correct answer. Likewise, there are increasing numbers of online question banks that teachers can draw on to set children formative assessment before they sit for summative examinations.[182] Similar such systems could readily be introduced by governments across the world, to help ensure that students and learners are familiar with, and can practice, the types of questions they will be asked in summative assessments. Another more controversial use of digital technologies in the classroom associated with formative assessment is the systems now being introduced to monitor student learning in real time. The Intelligent Classroom Behaviour Management System in use in some schools in China, for example, scans a classroom every 30 seconds and logs the following six types of behaviour by each pupil: reading, writing, hand raising, standing up, listening to the teacher, and leaning on the desk. The facial expressions of the pupils are also assessed and logged according to whether they appear happy, upset, angry, fearful, or disgusted. This information is then analysed and fed back to teachers so that they can better supervise the performance of their students.[183] This, though, may not be acceptable in all countries and cultures, because of the data privacy and ethical issues summarised elsewhere in this report.

Digital technologies are also increasingly being used for *summative assessment*, especially since more sophisticated systems are now available that enable securer communications and can reduce the ability of students to cheat. This applies both within formal education systems, as well as in professional examinations.[184] Indeed, there are predictions that by the mid-2020s traditional school exam systems will be entirely replaced by online summative assessment.[185] If such

[179] Estimates in 2018, for example, suggest that 17% of teachers in the UK spend more than 11 hours a week marking, and two-thirds of teachers say that the amount of time spent on marking negatively impacts the amount of classroom time that they can spend with children, https://www.tes.com/news/school-news/breaking-news/workload-tens-thousands-teachers-spend-more-11-hours-marking-every.

[180] WeTrans Technology Company, http://en.51chaoqun.com/, accessed 8th February 2018.

[181] See also, OKtranslation, http://www.oktranslation.com.cn/; with thanks to Qiong Wang for this information.

[182] See, for example, the WJEC which provide teachers, predominantly in Wales, with a question bank drawn from past examination papers so that they can set their pupils test papers before they have to sit public examinations, http://www.wjec.co.uk/question-bank/

[183] Intelligent classroom behaviour management system in Hangzhou, http://bbs.chinadaily.com.cn/forum.php?mod=viewthread&tid=1892506

[184] See for example Deloitte's guidance on test options, https://www.graduatesfirst.com/portfolio-items/deloitte/

[185] Burns, J. (2013) Online tests to replace paper exams within a decade, http://www.bbc.co.uk/news/education-24174535; World Bank (2018) Improving Armenia's Unified Entrance exam with Computer-Based Testing, http://www.worldbank.org/en/news/feature/2018/03/27/improving-armenias-unified-entrance-exam-with-computer-based-testing?cid=ECR_E_NewsletterWeekly_EN_EXT&deliveryName=DM2385

assessments can be sufficiently intellectually nuanced and flexible, they offer a significant time saving for all those involved in exam marking, and have the undoubted benefit of being consistent, replicable, and accurate. Reusable assessments, as a replacement for memory-based assessments or "disposable assignments", can also enable students to become co-creators of knowledge, with their outputs becoming inputs for the next generation of students.[186] Nevertheless, there remain important concerns that in reality much online assessment has so far tended to lead to a "learn and regurgitate" philosophy and practice, where there are indeed always "right" answers and children simply need to learn what these are. It is very difficult, for example, to set demanding summative assessments that test skills of critical thinking, creativity, communication or collaboration. Online summative assessment therefore at present tends to reinforce a model that emphasises learning accepted knowledge, rather than encouraging innovation and critical thinking.

This leads directly into the second main theme of this section on assessment, which is that *all digital assessment should be appropriate*. In many instances, especially where there is poor quality teacher training, and assessment primarily focuses on the regurgitation of accepted truths, ICTs have definitely reinforced a tendency towards a learn and regurgitate model of education rather than one that focuses on critical thinking and creativity. It is thus very important that assessment schemes are designed for the context in which they are to be used, and that they do not constrain the learning activities of children and adult learners. Focusing on the learning and assessment needs of those living in marginalised contexts, it becomes even more important to ensure that assessments are indeed appropriate to the skills and knowledge that they need to acquire to live fulfilled lives. In many countries, the assessments, and thus teaching, requirements remain based largely on a curriculum that is of little relevance to the needs of the most marginalised members of society. Many question the value, for example, of requiring a knowledge of William Shakespeare's works in some African curricula and assessment schemes.[187] To be sure, Shakespeare's work has been a very significant influence on the English language, but its relevance to the everyday lives of children living and working on the streets of an African or Asian city seems far removed from their realities, and to smack of an elitist neo-colonial/imperialist approach to curriculum and assessment design and implementation. It is fundamentally important that curriculum, content (see Guidance Note on local content) and assessment materials are all designed appropriately within the context where they are to be applied, and not just imported from the USA or Europe. A further very basic issue is that learners should not be assessed through technologies with which they are not familiar. Put simply, asking someone to use a desktop computer or tablet for an assessment when they have never been able or allowed to use one before, is unfair, and will in any case not provide a valid assessment of what they have learnt.

Furthermore, this reinforces the point that poor people and those in marginalised communities need to be able to have *access to relevant assessments*.

[186] David (2013) What is open pedagogy, https://opencontent.org/blog/archives/2975.
[187] See, for example, Tembo, T. (2017) Shakespeare should fall from school curriculum, IOL, https://www.iol.co.za/news/south-africa/western-cape/shakespeare-should-fall-from-school-curriculum-professor-8394832 ; Goudry, T. (2018) African writers: broadening the literature curriculum, Half Educated, https://halfeducated.com/2018/03/11/african-writers-broadening-the-literature-curriculum/

Unless every school has good, reliable infrastructure to enable digital assessments to be held, then once again inequities will be introduced into the education system. This applies not only in school, but also in lifelong learning and employment-related training. Asking people to travel long distances to assessment centres that do indeed have such connectivity is no solution, because it will also marginalise those who have had to travel the furthest and most difficult distances. This links to a second point which is that assessment should preferably capture learning at the place where it happens. Again, the latest digital technologies have the potential to help greatly in achieving this, but such systems are expensive and as yet in most contexts insufficient emphasis has been placed on this. A third important aspect of access to digital assessment is the issue of the languages in which online assessments are held. In countries with multiple languages all digital assessments should ideally be in the native languages that citizens speak. This presents very real challenges in countries such as Ethiopia with around 86 individual languages, or even more so in Papua New Guinea with 840 living languages.[188]

A final issue that governments need to address is the *linkage between assessment and certification* or accreditation. This is a large and complex field, but sophisticated digital methods can indeed facilitate the introduction of new methods of compiling diverse assessment pathways through which learners can gain accreditation. For example, digital badges can be used not only in the skills and knowledge required for a particular job function, but also in schools and universities, to gain recognition and easily share information about people's learning achievements.[189] This is especially important in enabling people from all backgrounds to have evidence of their learning in forms that are readily accessible to employers. Recent advances in the use of blockchain to provide diplomas, certificates and badges have made them much more accessible and easy to use, and several universities are now using such technology for certification.[190] One of its main benefits is to help solve the challenges of fraud and fake certification.[191]

12.6 Ensuring learning for all

Section 12 has been fundamentally about the need for digital technologies to be used appropriately in support of universal education, not just for those in school, but also for those who for whatever reason are unable to participate in formal learning. This begins with the overall commitment of governments proactively to address and resource equity in their education systems, but also requires there to be in place appropriate pedagogies, committed teachers, and the digital technologies that enable them to share knowledge effectively with those wishing to learn.

[188] Ethnologue (2020) Languages of the World, 23rd edition, Dallas, TX: Ethnologue.
[189] See, for example, Learning and Performance Institute, Digital Badges, https://www.thelpi.org/digital-badges; Stefaniak, J. and Carey, K. (2019) Instilling purpose and value in the implementation of digital badges in higher education, *International Journal of Educational Technology in Higher Education*, 16, 44, https://doi.org/10.1186/s41239-019-0175-9.
[190] See the example of the University of Nicosia, https://www.unic.ac.cy/iff/blockchain-certificates/.
[191] See, for example, Blockeducate, Lifelong learning: blockchain for education, https://blockeducate.com/services/blockchain-for-education/,

This means that there must be a considerable shift in emphasis to much more flexible modalities of teaching and learning, for which teachers and other educational facilitators must also be prepared. They need to be given not only the tools, but also the continual professional development and training to enable them to facilitate pupil and student learning in varying circumstances in the most appropriate ways. COVID-19 has illustrated the many potential benefits enabled by the wise use of digital technologies in support of learning out-of-school during pandemics,[192] but it has also very clearly shown that the most marginalised learners and communities have not sufficiently been able to reap these benefits. In planning for more resilient education systems in the future that may require large numbers of people to be educated out-of-school for considerable periods of time, there is also a golden opportunity to ensure that all those who cannot normally participate in formal school education are indeed able to do so. However, at the same time, it is also essential that governments continue to provide alternative learning methods for those who for whatever reason are unable to access or use digital technologies, so that they are not even further disadvantaged.

All governments have a duty to ensure that digital technologies are used appropriately in support of universal education, not just for those in school, but also for those who for whatever reason are unable to participate in formal learning. If they cannot do so, they have to ensure that alternative methods of learning are put in place for those who do not have the benefits of using digital technologies.

[192] EdTech Hub (2020) Resources on Coronavirus (COVID-19) and EdTech, https://edtechhub.org/coronavirus/.

13 Making wise use of technology: security, privacy and data

1. A whole society approach: delivering equity in education
2. Enabling access for all: building appropriate resilient infrastructures for education
3. Being context specific: technologies and content
4. Ensuring appropriate pedagogies: the practices of teaching and learning
5. **Making wise use of technology: security, privacy and data**

Issues concerned with the safety, security and privacy associated with digital technologies have surfaced throughout the previous sections of this report. They have also been very apparent during the COVID-19 outbreak, with substantial increases in online violence and abuse during the pandemic, especially against girls and women.[193] These issues are brought together in this fifth set of recommendations because of their great importance, as well as the particular role that governments can play in helping to get them right. They all require careful balances to be made. How much should children's personal data, for example, be made available to education companies as they seek to build technologies which may improve other children's learning, but from which they may also gain considerable profit? A key role of governments is to put in place the structures and governance arrangements to ensure that whatever decisions are made with respect to these issues they do indeed reflect the interests of their societies as a whole. A particular challenge is that such decisions may not always be in the interests of the poorest and most marginalised. This Report therefore places special emphasis on the need for governments to remember their role as an arbiter of what is right and fair in reaching wise decisions with respect to the use of digital technologies that will indeed be in the interests of the often voiceless children and adults who are the most marginalised.

This is not to deny the undoubted benefits of using many digital technologies within education systems to enhance the quality and availability of learning, but it is to serve as a reminder of the negative attributes of their use that must be mitigated if these benefits are to be gained by everyone. Digital technologies usually serve as accelerators that can rapidly extend the reach of information and ideas, both good and bad. Hence, their use raises profoundly moral questions.[194]

UNICEF's (2017) seminal review on *Children in a Digital World*, provides a clear and helpful overview of the key issues that need to be considered.[195] This highlights

[193] Web Foundation (2020) There's a pandemic of online violence against women and girls, https://webfoundation.org/2020/07/theres-a-pandemic-of-online-violence-against-women-and-girls/.
[194] See, for example, the ongoing work by the ITU and UNESCO on AI and ethics: Dignum, V. (2017) Responsible Artificial Intelligence: designing AI for human values, *ITU* Journal: ICT Discoveries, Special Issue 1: 1-8, https://www.itu.int/dms_pub/itu-s/opb/journal/S-JOURNAL-ICTF.VOL1-2018-1-P01-PDF-E.pdf,; ITU (2019) AI for good: paths forward. Progress through Innovation, *ITU News Magazine*, 3, https://www.itu.int/en/itunews/Documents/2019/2019-03/2019_ITUNews03-en.pdf; UNESCO (2019) Elaboration of an instrument on ethics of artificial intelligence, https://en.unesco.org/artificial-intelligence.
[195] UNICEF (2017) *The State of the World's Children 2017: Children in a Digital World*, New York: UNICEF, https://www.unicef.org/publications/files/SOWC_2017_ENG_WEB.pdf.

the three forms of risk, in terms of content, contact, and conduct, and then summarises ways through which these intersect with three main harms: aggression and violence, sexual abuse, and commercial exploitation. Above all, it emphasises the need to protect children from cyberbullying and from online sexual abuse and exploitation. Such protection is also important for vulnerable adults, and other marginalised groups, because they often have little prior expertise or training in ways through which they can be harmed through the use of digital technologies.

In summary, this section addresses the following five themes:

1. Ensuring the safety of everyone involved in teaching and learning
2. Promoting the security of systems
3. Caring about privacy
4. Managing data appropriately
5. Effective monitoring and evaluation

These are particularly supported by specific Guidance Notes on the following:

- Monitoring and evaluation
- Ensuring that children are safe when using digital technologies

13.1 Ensuring the safety of everyone involved in education and learning

COVID-19 has illustrated very clearly the ways through which increased levels of digital connectivity and use during the pandemic have also translated into increases in online abuse and especially sexual harassment.[196] This is a clear reminder of what many have been saying for a long time, that as more people of whatever age and background turn to online learning, it is essential to ensure that they can do so safely (see Guidance Note on safety in learning). This requires a range of integrated good practices in the following main areas:

- Learners being trained in ways of using digital technologies safely;[197]
- Extensive guidance in multiple languages on ways to respond to online abuse;[198]

[196] See, for example, accounts from India, CIvID-19 lockdown, working women complain of 'online sexual harassment, say experts, *The New Indian Express*, https://www.newindianexpress.com/nation/2020/jun/01/covid-19-lockdown-working-women-complain-of-online-sexual-harassment-say-experts-2150824.html, Web Foundation (2020) There's a pandemic of online violence against women and girls, https://webfoundation.org/2020/07/theres-a-pandemic-of-online-violence-against-women-and-girls/; and Brewster, T.. (2020) Child exploitation complaints rise 106% to hit 2 million in just one month: is COVID-19 to blame?, https://www.forbes.com/sites/thomasbrewster/2020/04/24/child-exploitation-complaints-rise-106-to-hit-2-million-in-just-one-month-is-covid-19-to-blame/#64cdd1854c9c.

[197] See, for example, NSPCC, Online Safety, https://www.nspcc.org.uk/keeping-children-safe/online-safety/.

[198] See TaC International, http://cybervictim.help/; Unwin, T. (2020) Responding to digital violence in pandemics: how to take action during Covid-19, https://93bits.com/cyber-victim-help/responding-to-digital-violence-in-pandemics/?fbclid=IwAR2WQaUNrz8-wNMdzjXkpCo89OXd7_JZg4lmLfR1Mhxj4_Q2Qz2k2oMQGbQ.

- Implementation of legislation to take down inappropriate sites and networks;[199]
- The introduction and support of relevant helplines;[200]
- Support and help for survivors of online abuse and harassment; and
- Effective policing to prevent criminal acts from being perpetrated.

The safe use of digital technologies must be an integral part of all learning and training programmes that involve the use of digital technologies by children and adults alike. This is partly a curriculum issue, but it goes well beyond the usual school curriculum, and parents or guardians need appropriate training and advice when their children start school.[201] It must also be remembered, though, that adults learning to use digital technologies for the first time may be equally susceptible if they do not receive similar advice and training, and likewise women in patriarchal societies who often have little experience of how to use digital technologies safely are also particularly vulnerable.[202]

13.2 Promoting the security of systems

Governments can do much to help ensure that digital systems used across their education sectors are secure and less vulnerable to harms of any kind than they might otherwise be. Unfortunately, such systems are often very decentralised, and it is usually therefore not possible for Ministries of Education systematically to do much to provide secure systems in every school. Nevertheless, there are still some important things that can be done: through procurement systems that are well informed by digital security agendas; ensuring that government wide systems are as secure as possible, especially in Ministries of Education; providing very clear guidance to education establishments on good digital security; and providing fast, efficient support and remedial action when a digital security breach is identified. Digital security is as strong as its weakest links, and that link is usual human. It is estimated that around half of all digital security issues in educational establishments are carried out or caused intentionally or unintentionally by people within them. It is therefore essential to include basic digital hygiene training at the start of all learning programmes, and for regular reminders to be provided not only for children in schools, but also for adults involved in vocational and lifelong learning activities.

Much advice is already available to governments and educational establishments about the main threats and security priorities that they should have in place to make their systems resilient. All governments should make such information

[199] See, for example, Internet Watch Foundation, https://www.iwf.org.uk/.
[200] See example of Pakistan's cyber harassment helpline developed by the Digital Rights Foundation, https://digitalrightsfoundation.pk/digital-rights-foundation-launched-cyber-harassment-helpline-two-year-report/.
[201] The UK government, for example, introduced a very clear and simple webpage on support for parents and carers to keep children safe online during COVID-19, https://www.gov.uk/government/publications/coronavirus-covid-19-keeping-children-safe-online/coronavirus-covid-19-support-for-parents-and-carers-to-keep-children-safe-online. This is an example that could readily be followed elsewhere.
[202] See Hassan, B, Unwin, T. and Gardezi, A. (2018) Understanding the darker side of ICTs: gender, harassment and mobile technologies in Pakistan, *Information Technologies and International Development*, 14, 1-17.

easily available for school leaders and administrators in their educational districts to act upon. The following are widely seen as the most significant threats that need to be prevented by schools and other educational establishments:[203]

- Unauthorised disclosure and theft of pupil/student records;
- Hacks and breaches affecting school operations;
- Phishing and credential misuse;
- Distributed Denial-of-Service (DDOS) attacks
- Corruption of digital technology and security systems;
- Extortion through ransomware;
- Internet of Things (IoT) vulnerabilities.

Governments need to ensure that there are mechanisms in place to guarantee that appropriate processes are followed at all levels within the education system, from the ministry down to the individual school. The precise requirements will differ, but the basic principles need to be in place throughout. In particular, at the government level, the basic system architectures need to be reviewed externally before they are built, they need to be tested by red teams or cells[204] prior to going live, and they need to be constantly reviewed and updated. A useful point to remember is that good professionals enable things to work securely for the user; a bad professional makes sure things are secure, but don't work for the user.

A basic checklist of some of the more important things that need to be in place in all education establishments is given below; the same basic elements, albeit of different complexities, can apply from schools and community digital centres to regional education offices, or indeed education ministries and departments:[205]

- There should be appropriate training for all educators and learners in security awareness;
- The principle of least privilege should be adopted, so that most users can legitimately access only the information and resources that they actually need;
- Two-factor authentication should be used whenever possible;
- Efficient network and data monitoring protocols should be in place;
- Clear protocols for incident detection and response should be in place and adhered to;

[203] Derived in part from the Consortium of School Networking infographics (see https://www.cosn.org/sites/default/files/Resources%20for%20the%20EmpowerED%20Superintendent%202020%20-%20Cybersecurity.pdf, https://www.cosn.org/cybersecurity), and CI Security, Top 10 cybersecurity priorities for schools, https://ci.security/resources/news/article/top-10-cybersecurity-priorities-for-schools.

[204] These are groups of specialist hackers whose task is to try to break the systems being put in place.

[205] Derived in part from CI Security, Top 10 cybersecurity priorities for schools, https://ci.security/resources/news/article/top-10-cybersecurity-priorities-for-schools. See also Venter, I.M., Bignaud, R.J., Renaud, K. and Venter, M.A. (2019) Cyber security education is as essential as "the three R's", *Heliyon*, 5(12), e02855, https://doi.org/10.1016/j.heliyon.2019.e02855; Swivelsecure, Why cybersecurity needs to be a priority for the Education Sector, https://swivelsecure.com/solutions/education/why-cybersecurity-needs-to-be-a-priority-for-the-education-sector/, and Walter, N. (2019) Improving cybersecurity in education systems, https://www.techradar.com/uk/news/improving-cybersecurity-in-education-systems.

- There needs to be effective vulnerability scanning and patch management (all educational institutions must ensure that they are running the latest updated versions of software that include relevant patches to protect against vulnerabilities);
- If funding prevents regular upgrading of systems and software, it is very important that alternative stop-gap initiatives are taken to continue to protect legacy systems;
- Controls need to be implemented to prevent physical access to hardware (protecting against both theft and the introduction of viruses through USB sticks) and also software access, through the use of virus protection systems and firewalls (some of which are freely available[206]);
- Introducing network segmentation where possible, to limit both vertical and horizontal flow of any attack; and
- Ensuring that all vendors providing digital technologies to schools are vetted and aware of the importance of security in the educational context.

Advice over password policies has evolved, and the following tips developed by the UK's National Cyber Security Centre are particularly helpful for all those responsible for managing systems:[207]

- Reduce educational organisations' and schools' reliance on passwords
- Implement effective technical solutions
- Protect all passwords
- Help users cope with password overload
- Help users to generate better passwords
- Use training to support key messages

Governments can do much to promote and share information about such good practices and lead by example in implementing them throughout their education systems.

13.3 Caring about privacy

The balance between digital security and privacy is often controversial, reflecting the views of the very divergent interests involved in the digital technology sector. COVID-19 has dramatically brought these to the forefront of many people's minds, particularly with respect to the ethics surrounding disease tracking apps.[208] The ways through which governments respond to these issues depend largely on their own interests and the balance between individualistic and communal interests of those living within the

[206] Always seek professional advice, or explore the latest recommendations in reviews such as https://www.antivirussoftwareguide.com/best-free-firewall-protection-software.
[207] NCSC, Password administration for system owners, https://www.ncsc.gov.uk/collection/passwords/updating-your-approach#tip1-password-collection.
[208] See, for example, Floridi, L. (2020) COVID-19 Tracing App Series, Data and Marketing Association, https://dma.org.uk/article/covid-19-contact-tracing-app-series-professor-luciano-floridi; and Floridi, L. (2020) Mind the app – considerations on the ethical risks of COVID-19 Apps, *Philosophy and Technology*, 33: 167-172, https://link.springer.com/article/10.1007/s13347-020-00408-5.

countries that they govern. These issues are, though, made more complex because of the very intrusive measures that some private sector corporations adopt to gain personal information about people, even within individualistic societies.[209]

In general, cultures that have more communal traditions are more open to sacrificing privacy in the interests of the common good, especially where they have governments that are authoritarian and controlling. In contrast, there is a paradox in countries with more individualistic traditions, where many people do not want governments to have access to information that they consider to be private, but are surprisingly willing to give this away for free to companies who will generate massive profits from it.[210]

Further equally controversial challenges apply when considering privacy issues within the context of marginalisation and poverty. It can be argued that people who live their lives on the streets, for example, have generally many fewer opportunities to enjoy privacy than do those who live in plush gated communities in suburban areas. That does not, though, mean that those whose bed is the street do not want, need or deserve privacy. Likewise, marginalised isolated communities without access to the Internet, are without doubt much freer from the influence of intrusive private sector corporations than are young people in European and North American countries who spend much of their time on social media. It is not surprising, therefore, that these corporations are so eager to ensure connectivity for the "next billion".

These challenges are especially important within education systems and among marginalised communities. The marginalised are already by definition less fortunate than are most others within any society, and the dangers of any further loss of privacy for them are likely to marginalise and harm them even further. It is therefore essential that governments and citizens have open and sustained discussion about digital privacy in general, and also specifically within the educational context. Ethical issues are often best understood through practical questions, and the following two examples well illustrate the particular challenges involved:

- *Are anonymous randomised controlled trials of new digital technologies by companies based in European countries on children in primary schools in Africa appropriate*? Regardless of debates over the utility of such trials, those in favour are likely to answer that if the results can show that individual schoolchildren have benefitted from the technology, then the trials are indeed valid and useful. Those against, would argue that children's personal data are being exploited by the companies in the interests of generating greater profit from expanding their markets into Africa.
- *Should education systems use individualised data and behaviour tracking technologies to monitor multiple dimensions of a child's learning*? Again,

[209] See, for example, Nations, D. (2020) What does Google know about me?, *Lifewire*, https://www.lifewire.com/what-does-google-know-about-me-4587648; Curran, D. (2018) Are you ready? Here is all the data Facebook and Google have on you, *The Guardian*, https://www.theguardian.com/commentisfree/2018/mar/28/all-the-data-facebook-google-has-on-you-privacy; Malik, D. (2019) Here is how Facebook knows everything about you, *Digital Information World*, https://www.digitalinformationworld.com/2019/01/what-does-facebook-know-about-you-really.html.

[210] For a wide discussion of some of these issues see Arora, P. (2019) *The Next Billion Users: Digital Life Beyond the West*, Cambridge, MA: Harvard University Press.

those in favour would argue that if such systems can be used to help both the individual and the learning community in general, then they are indeed valuable. Those against, would suggest that this is an infringement of the privacy rights of the children involved, who could be harmed and exploited by such initiatives.

People will have very different responses to these questions, and there are neither right nor wrong answers; they need to be negotiated.

In summary, governments should focus especially on two things with respect to individual privacy and the use of digital technologies for the most marginalised within education systems:

- *They should engage in widespread consultations with representatives of all members of society in reaching wise decisions*. This should involve not just the private sector, but also civil society organisations as equal partners, and above all representatives of marginalised communities to ensure that they are included and that their interests are indeed represented in the outcomes.
- *They should in general tend towards adopting the precautionary principle*[211] in decisions made over the use of digital technologies in educational systems, especially when concerned with the privacy of the most vulnerable and marginalised.

13.4 Managing data appropriately

Several of the above sections have touched on the analysis of educational data, particularly in the context of ethics, security, privacy and assessment. It is, though, an important issue in itself, and governments need to implement clear policies relating to data management in education. In essence, education systems have always generated considerable amounts of information about people throughout their lives, but the use of digital technologies has considerably increased not only the amount of such data, but also the length for which it is stored, and the number of people who can potentially access it. Questions that arise from this include: "Who should have access to such data?", "Where should it be stored?", and "How should it be used?". These are not trivial to answer, and as illustrated throughout this report, context matters; people from different cultures and backgrounds will respond in different ways. Moreover, data are now often stored in cloud-based servers with multiple, real-time, off-continent backups, which means that end-users usually no longer know where their data are being stored, even though it can appear to be local.

Data of all types that help teachers and learning facilitators to improve the learning that they provide, that facilitate fair assessment processes, and that enable employers to have better information about job applicants are all valuable. However,

[211] This implies that caution should be adopted when innovating with digital technologies, and that there should be careful pausing and review before widespread implementation of potentially harmful initiatives takes place in education systems. Critics point out, though, that this can be an obstacle to progress. See Bourguignon, D. (2015) The precautionary principle: definitions, applications and governance, Strasbourg: European Parliament, https://www.europarl.europa.eu/RegData/etudes/IDAN/2015/573876/EPRS_IDA(2015)573876_EN.pdf.

one of the main challenges that arises is whether data generated in public education systems should be used by private sector corporations to generate profit. On the one hand, such data can indeed be used to improve the quality of learning by further improving the digital technologies themselves. On the other, such data have ultimately been produced from a system funded by taxation revenue, and are therefore a public good, albeit one that contains much personalised and private data. These are not easy issues to resolve, but it is important that governments do indeed address them, especially if they may disadvantage more marginalised communities. In general, digital technology companies naturally try to extract the highest possible profits from education systems, and these are unlikely to be generated from solutions that are designed to support learning by the poorest and most marginalised who can least afford the latest technologies. These issues can sometimes be resolved by education regulators or relevant intergovernmental organisations,[212] but these are most often concerned with teaching and the curriculum rather than with data. This again, reinforces the need for whole government approaches that combine the interests of technology-related regulatory authorities alongside those responsible for teaching and learning.[213]

Increasingly the influence of the private sector on educational curricula has led to wide-ranging questions regarding teachers' and students' intellectual autonomy, privacy and surveillance[214]. The rise in the creation and use of Big Data[215] and algorithmically driven decision making have become increasingly intertwined with educational policymaking, curriculum design and assessment. In many ways, learners' roles have been re-defined as users and consumers of digital technologies[216]. Governments therefore must play a critical role in ensuring that teachers' and learners' experience, privacy, and freedom of expression are central to any digital educational interventions. It is the government's duty above all to protect them from harm.

13.5 Effective monitoring and evaluation

The final element in this section focuses on the importance of governments putting in place effective, robust and relevant systems to monitor and evaluate the uses of digital technologies in education within their countries (see also specific Guidance note on

[212] See, for example, the work of AFTRA, the Africa Federation of Teaching Regulatory Authorities, https://www.iftra.org/Members/AFTRA.aspx

[213] For an interesting example from China, see Schaub, M., Feng, I. and Guo, S. (2019) China tightens regulation for online education, *China Law Insight*, https://www.chinalawinsight.com/2019/11/articles/regulation/china-tightens-regulation-for-online-education/.

[214] See, for example, Knox, J., Williamson, B., and Bayne, S. (2020) Machine behaviourism: future visions of 'learnification' and 'datafication' across humans and digital technologies, *Learning, Media and Technology*, *45*(1): 31-45; Hillman., V. (2019) Student agency in a data-driven educational ecosystem, https://jods.mitpress.mit.edu/pub/bw0s06i8/release/1; Zuboff, S. (2019).*The Age of Surveillance Capitalism: The Fight for a Human Future at the New Frontier of Power*, Profile Books.

[215] Big Data is understood here as extremely large data sets that may be analysed computationally to reveal patterns, trends, and associations, especially relating to human behaviour and interactions.

[216] See, for example, Hemy Ramiel (2019) User or student: constructing the subject in Edtech incubator, *Discourse: Studies in the Cultural Politics of Education*, 40:4, 487-499, DOI: 10.1080/01596306.2017.1365694

Monitoring and Evaluation). It is essential for everyone involved in education systems to know what children are learning, how they are learning, and how effective the digital technologies are. As discussed above in Section 13.4, digital assessment can indeed help resolve some of these issues, but the issue of effective monitoring and evaluation is far broader than this.

A lack of good and sufficient understanding about the use of digital technologies in many different parts of the world was one of the reasons for the establishment by DFID and the World Bank of the EdTech Hub in 2019, with the aim of increasing the effective use of education to inform decision-making about the uses of digital technologies in education.[217] It has already brought together a wealth of research knowledge about good practices that may be of use to governments and others interested in drawing on such advice. Within specific countries it is also very important for governments to learn more about what works in their own contexts. One important finding from many technology-for-education initiatives is that one size does not fit all, and it is always essential to take local context into consideration. There are at least three main challenges with much of the research that contributes to monitoring and evaluation, especially as far as policy implications are concerned:

- First, short-term quantitative and long-term qualitative methods usually generate very differing results. Moreover, there is often a systemic bias in much evidence-based policy making, especially by governments and international organisations, whereby they prefer large scale quantitative studies, which have theoretically representative samples, to the often more valuable insights gained from in-depth hermeneutic and qualitative approaches.
- Second, biases are often introduced because of the interests of the people doing the research or monitoring and evaluation. Many ICT for education initiatives have begun as pilot projects, either developed by companies or civil society organisations eager to show the success of their technologies, or by researchers eager to prove that their innovations work. It is perfectly natural that the ways through which they design their research, and the metrics that they choose will seek to highlight the intended positive outcomes. All too often, though, unintended consequences are ignored or simply not looked for, despite the fact that these frequently provide the most interesting insights.
- Third, much depends on the aims of the research. Tightly constrained experimental design to explore, for example, how the use of a particular device influences activity in certain parts of the brain, can indeed show apparent causality. Linking that, though, to wider conclusions about children's learning and the desirability of incorporating a specific technology into schools is much more difficult

It is also important for governments to distinguish clearly between the aims and purposes of the two related terms "monitoring" and "evaluation". Monitoring is the ongoing internal review by those involved in teaching and learning so as continually to improve their performance, whereas evaluation is a periodic overview, usually by an external entity, of the overall performance of a system against its original targets. These are very different processes with different intentions and approaches. In the context of this Report monitoring and evaluation can thus be considered in three main

[217] https://edtechhub.org

ways: the regular ongoing monitoring of teacher and student performance; the monitoring of progress in specific ICT for education initiatives; and the final evaluative review of any such initiative, often examining eventual outcomes against original objectives. Significantly, digital technologies themselves can be very valuable in generating data that can be analysed in support of all of these three elements, and especially for the ongoing monitoring of student and teacher performance.[218] Various schemes, for example, have been implemented to monitor teacher and student attendance in parts of India, Pakistan and China, using fingerprint or facial recognition technology.[219]

In developing such monitoring and evaluation systems governments should finally remember two key issues:

- First, monitoring and evaluation are expensive to do well. As a general rule of thumb, the amount spent on monitoring and evaluation should be around 10% of total project costs, although a report in 2017 has suggested that this figure should be nearer 20%.[220] If researchers, companies or civil society organisations wish to undertake projects in public schools, governments could readily insist that 10% of their project costs should be spent on monitoring and evaluation, and that the results should be made publicly available through a Creative Commons license.
- Second, there is now much good evidence on ways through which both monitoring and evaluation can be done effectively, yet much of this is ignored, and many initiatives using digital technologies in schools or with marginalised communities seek to reinvent the wheel and develop their own approaches.[221] This has the unfortunate effect of meaning that the outcomes of many studies cannot readily be compared. Governments therefore need to ensure that as far as possible some aspects of the

[218] See, for example, Literator, which combines solutions for teaching, planning and predicting, so as to advance equity in the classroom and reduce barriers to access so that every child is supported to become successful, https://www.go.literatorapp.com/.

[219] Times of India (2015) Biometrics attendance for teachers from June, https://timesofindia.indiatimes.com/city/pune/Biometrics-attendance-for-teachers-from-June/articleshow/46980678.cms; Biometric attendance system in Punjab, http://www.pakworkers.com/news/biometric-attendance-system-for-punjab-school-teachers-is-ready/; in KPK Government colleges, https://timesofislamabad.com/biometric-attendance-system-kpk-government-colleges/2016/08/31/; and http://www.iritech.com/blog/biometric-education/,

[220] Newman, D., Jaciw, A.P. and Lazarev, V. (2017) *Guidelines for Conducting and Reporting EdTech Impact Research in US K-12 Schools*, Palo Alto: Empirical Education and ETIN, https://www.go.literatorapp.com/.

[221] For overall guidance, see Wagner, D.A., Day, B., James, T., Kozma, R.B., Miller, J., and Unwin, T. (2005) *The Impact of ICTs in Education for Development: a Monitoring and Evaluation Handbook*, Washington DC: infoDev, http://www.infodev.org/infodev-files/resource/InfodevDocuments_9.pdf; and Newman, D., Jaciw, A.P. and Lazarev, V. (2017) *Guidelines for Conducting and Reporting EdTech Impact Research in US K-12 Schools*, Palo Alto: Empirical Education and ETIN. For examples of good practice, see the work of the Omar Dengo Foundation, especially in Costa Rica, Fundación Omar Dengo, Investigación y Evalucaión, Informática Educativa, http://www.fod.ac.cr/index.php?option=com_content&view=article&id=1&Itemid=161; and Jigsaw Consult's review of the Mohammed Bin Rashid Smart Learning Program in the UAE, Jigsaw Consult (2014) MBRSLP Research 2013-2014, https://www.pdffiller.com/299517646-MBRSLP-research-2013-2014pdf-Jigsaw-Consult-Document-Mohammed-Bin-Rashid-Smart-Learning-smartlearning-gov-Various-Fillable-Forms.

methodologies used for monitoring and evaluation of different digital technology in education initiatives in their countries are similar.

The issue of monitoring and evaluation is far more complex than this short summary can note, and further key advice in abbreviated format is given in the Guidance Note on the subject.

PART III: Conclusions

Part II of this Report has made recommendations on the five most important themes that governments must address if they seek to use digital technologies successfully for supporting the learning and education of the most marginalised people within their states. Many people consider that such an undertaking is too expensive for governments in "developing" and "least developed" countries, but it need not be so. Many of the most fundamental recommendations are not impossibly expensive to deliver. Indeed, as was said earlier, "*if you think education is expensive, try ignorance*" (see Section 3). This final part of the Report therefore suggests some of the ways through which these recommendations may be financed (Section 14), and then draws a small number of overarching conclusions. It also introduces the 14 Guidance Notes (Act Three) that provide succinct and specific suggestions for governments to follow in taking these recommendations forward in practice.

14. Financing the use of digital technologies within public education systems to serve the poorest and most marginalised.

This Report has stressed throughout that delivery and funding of digital technology within national public education systems should be planned for and implemented through integrated holistic cross-government policies; it should not be merely the responsibility of Ministries of Education. This section provides an overview of ways through which the use of digital technologies by the most marginalised for the purpose of learning can thus be funded, focusing on four main issues:

1. The case for the funding of public education systems for the most marginalised.
2. Funding principles for the use of digital technologies by the most marginalised within public education systems.
3. Funding this report's recommendations.
4. Getting the systems right: appropriate use of digital technologies in education for the most marginalised may not be as expensive as you think.

14.1 The case for funding public education systems for the most marginalised

Public education systems across the globe have been insufficiently funded for far too long. To add expensive digital technologies to the education bill therefore usually makes little sense, and it is simply unaffordable for most Ministries of Education to do this effectively. Creative and innovative models of funding must therefore be identified to deliver the highest quality of education to as many people as possible.

The first and most important priority must be for governments and people to recognise this agenda and make clear long-term commitments to the very necessary and appropriate levels of funding that are essential for public sector education systems. This Report goes further, and argues in the interests of the poorest and most marginalised that the principle of equity is an essential part of any such a commitment. Providing appropriate and effective learning opportunities for the most marginalised is always going to more expensive than it is to provide such opportunities to those who are already reasonably well-off. However, it is not only morally right to do so, it can also bring fundamental and lasting benefits to the whole of society.

The case for the appropriate funding of education has long been made by international agencies, especially those within the UN system.[222] Indeed, many of the world's greatest challenges, from reducing environmental devastation to preventing wars and major outbreaks of violence, can best be attributed to the failures of education systems. Overcoming the effects of COVID-19, for example, itself indicates the very significant improvements in our education systems that will be required for dealing with and managing future pandemics. Good public education for all has clear

[222] See, for example, Rose, P. and Steer, L. (2013) *Financing for Global Education: Opportunities for Multilateral Action*, Paris: UNESCO and Center for Universal Education at Brookings, https://unesdoc.unesco.org/ark:/48223/pf0000223289; UNESCO (2020) *Global Education Monitoring Report, Inclusion and Education: All Means All*, Paris: UNESCO.

cultural, social, political and economic value, making it one of the most important things for all governments to prioritise in their budgeting

Education is probably of most importance for its *cultural* and *social* values. It is the main way through which one generation passes on its values, understandings and meanings in life to the next generation. These cultural values are in turn crucial in shaping social structures, and determining whether people want to live in individualistic societies in which all that matters is individual freedom to be as economically, socially and politically successful as possible, or instead whether they want to live in societies where everyone is valued, where diversity is applauded, and where communal interests matter. The latter tend to be most supportive of those who are most marginalised and do not have the abilities to succeed in contexts where "I" is of more importance than "we". Education is also of crucial importance in guiding the *political* principles that underly government functions and governance structures. Again, with reference to the most marginalised, it helps determine whether or not they have a voice in shaping their own futures. Education provides a better understanding of how citizens can hold their governments to account, and can help people move beyond simplistic calls for human rights to understanding the need for individual and collective responsibility to ensure that those rights can indeed be upheld. Yet, education is frequently and increasingly seen as being primarily concerned with providing labour with the skills for enhanced *economic* productivity. To be sure, everyone requires the skills and knowledge to be able to gain employment and to lead fulfilled lives, but to do so they need to live in places that uphold the cultural, social and political structures that make this possible.

At its simplest, it is worth governments funding public education for the most marginalised so that rather than being seen as a burden that needs to supported (if at all) through social welfare systems, they can instead become productive contributors to the societies of which they are an integral part. The best, but often hidden, secret of digital technologies is that they can become a very powerful and cost-effective means for facilitating this. One of the clearest ways through which this happens, for example, is when people with disabilities start to gain fulfilling employment with the assistance of digital technologies. Instead of relying on charity support, they can then become active taxpayers, not only living more fulfilling lives themselves, but also contributing financially to the well-being of others and the greater common good. The same can also apply with the creative and innovative use of digital technologies to support and transform the lives of many other marginalised groups and individuals.

The first and most important thing that governments have to get right is to have the will and the creative vision to make education for the most marginalised a reality.

Once this vision is in place, then the best ways can be identified through which digital technologies can be used creatively in each specific context to support quality education for all. COVID-19, particularly with its school lockdowns, has clearly shown most of the world's population not only how worryingly fragile education systems are, but also what the reality of learning and living out of school is actually like. This is the everyday reality for millions of children across the world, whose norm is not to be in

school. Governments must begin with the education and not with the technology.[223] Only once the optimal use of context-specific technology has been agreed, can the funding systems then be put in place to deliver their appropriate usage.[224]

14.2 Funding principles for the use of digital technologies by the most marginalised within public education systems

There are eight basic principles that governments should adopt in funding the use of digital technologies, several of which have already been highlighted elsewhere in this Report:

- Funding should not simply be allocated equitably, but must also be based on the principle of equity so that additional funding is made available to those most in need;
- Holistic cross-government approaches are essential;
- The state has the main responsibility for funding public education, but, when used effectively and appropriately, donors, the private sector, households and civil society can also contribute funding;
- All funding models must be based on the lifetime total cost of ownership of an initiative and include both CAPEX and OPEX;
- Multi-sector partnerships can offer significant benefits, but only if undertaken appropriately and effectively;
- Initiatives should be designed at scale, even if they are only started with pilot projects; nothing will "go to scale" unless it is "designed at scale";
- All government policies relating to the use of digital technologies in education should be based on the principle of technology neutrality;
- In general, public sector education should be free to end-user; this is especially so for the poorest and most marginalised.

Reaching the most marginalised, be they in remote regions, refugees, or people living with disabilities, will usually cost more than delivering education for the majority of people who already have access to it. Hence, simply giving every educational institution or region the same levels of funding will perpetuate inequalities. This is especially so with the use of digital technologies, since they serve primarily to exacerbate existing inequalities. Hence, governments need to recognise that delivering quality education to the most marginalised will become more expensive the more marginalised the context. As noted above, though, the returns of ensuring that the most marginalised receive a quality basic education are high, and such investment

[223] Indeed, the term "EdTech" should be abandoned, because it places the emphasis on the technology rather than the education, and primarily serves the interests of the companies promoting sales of their digital technologies rather than those of learners, especially the poorest and the most marginalised.

[224] It is also very important to stress the need for effective monitoring and evaluation (see relevant Guidance Note); see also Patrinos, H.A. (2020) How to invest in remote learning while building the education system of the future, World Bank Blogs, https://blogs.worldbank.org/education/how-invest-remote-learning-while-building-education-system-future?cid=SHR_BlogSiteShare_EN_EXT?cid=SHR_BlogSiteShare_EN_EXT.

is worth it.[225] To achieve this equity principle, governments should therefore focus funding initially on providing effective and appropriate digital technologies to the most marginalised, recognising that the private sector is likely to provide solutions to "the next billion", and the rich can pay for it themselves. One of the best examples of trying to deliver this principle in practice has been the Plan Ceibal in Uruguay.[226]

It is also essential that governments adopt a holistic approach involving all of the necessary ministries in delivering effective practices using digital technologies in education (see also Section 5 and Annex 3). Most Ministries of Education, whose budgets are already very constrained and often over-burdened simply with paying teacher salaries, cannot afford to pay the additional costs associated with the introduction of new digital technologies. Local Education Departments likewise cannot afford alone to cover the costs of "fibre to the school". However, if the government as a whole plans carefully to introduce connectivity to communities, combining delivery of government services, health and education, then such costs can be shared more widely across different functions and services.[227]

Each government will have its own view about the extent to which they will engage with the private sector in funding the delivery of public services, such as education. However, increasing evidence suggests that the use of private financing initiatives (PFI) partnerships, especially in countries such as the UK which first championed it, have actually often worked out as being much more expensive than if governments had taken out loans through normal mechanisms to deliver such projects and activities.[228] Economically poorer countries should heed such warnings, and explore other ways through which to finance such programmes. Mutilateral- and bilateral-donors, for example, are often willing to support well-thought-through programmes that do indeed deliver on such an agenda, although great care is needed to avoid these simply becoming means through which private sector companies, civil society organisations and international consultants from donor countries line their pockets at the expense of the poorest and most marginalised.[229] Civil society organisations and indeed individual households may also have the capacity and willingness to contribute to worthwhile education initiatives, if they can see real benefits in so doing.

[225] Dickson, M. (2011) Economic returns to education: what we know, what we don't know, and where we are going – some brief pointers, *Economics of Education Review*, 30(6): 1118-1122. https://www.sciencedirect.com/science/article/abs/pii/S0272775711001361?via%3Dihub; Psacharopoulos, G. and Patrinos, H.A. (2018) Returns to investment in education: a decennial review of the global literature, World Bank Policy Research Working Paper 8402, Washington DC: World Bank, https://openknowledge.worldbank.org/bitstream/handle/10986/29672/WPS8402.pdf?sequence=1&isAllowed=y.

[226] Plan Ceibal, https://www.ceibal.edu.uy.

[227] See, for example, the work of the UAE-led Government Experience initiative, which is seeking to highlight good practices in the use of digital technologies across government service delivery, https://gx.ae/.

[228] See, for example, Jubilee Debt Campaign (2017) *The UK's PPPs Disaster: Lessons on Private Finance for the Rest of the World*, London: Jubilee Debt Campaign, https://jubileedebt.org.uk/wp-content/uploads/2017/02/The-UKs-PPPs-disaster_Final-version_02.17.pdf.

[229] The Times (2020) Ministers gave £275m of aid cash to firm that built 'unsafe' schools in Pakistan, *The Times*, 28 July 2020, https://www.thetimes.co.uk/article/ministers-gave-275m-of-aid-cash-to-firm-that-built-unsafe-schools-in-pakistan-93dmx32br.

The principle of "total cost of ownership" is absolutely essential for all uses of digital technologies in education, and indeed beyond. All too often, introducing a piece of digital technology, as most often recently with tablets in schools, is seen as a one-off spend with little real attempt being made to assess the knock-on costs of introducing them into schools, and little attention paid to repair, maintenance and replacement. Although it is extremely difficult to get accurate financial figures about the failure of such schemes, the principle is well-enough established to insist that governments recognise that such schemes are always much more costly than they anticipate, and most are so costly that after the first cycle of hardware they can never be repeated. It is almost always better value for money to implement initiatives that use well-tried, robust, reliable and universal technologies, such as those using radio and TV, to provide basic education for the most marginalised.

Multi-sector partnership initiatives (in contrast to PFI), if implemented effectively can provide valuable mechanisms to fund the delivery of education in marginalised contexts (see Guidance Note on partnerships). COVID-19 has, for example, highlighted the ability and willingness of the private sector to provide innovative solutions during the pandemic to help ensure continued delivery of education during times when children are out of school.[230] One of the simplest, quickest and most effective of these is simply to develop agreements that learners should be able to access key educational resources on a zero-rating connectivity basis.[231] These decisions can be initiated by providers as part of their Corporate Social and Environmental Responsibility (CSER) programmes, or they can reach agreements with governments partly to fund such schemes, through initiatives such as Universal Service/Access Funds. At the very least such programmes could be introduced as part of long-term planning for resilience in education to ensure that learners still have connectivity should schools be closed because of a future environmental disaster or pandemic. More broadly, governments should explore options for creating partnerships with the private sector and civil society to help fund digital access for those marginalised children who never attend school.

One of the most frequent complaints and challenges about the use of digital technologies in education is that there are problems in making it go to scale. Companies, innovators, civil society activists, and governments almost all begin with small scale pilot projects as proofs of concept, and then go and look for angel investors, donors or other external funding to take them to scale. Donors likewise almost always want a good evidence-base upon which to make funding decisions, and therefore expect appropriate pilot projects to have been properly evaluated before any further finding is allocated. It is, though, very easy to make a pilot project work. The problem is that most pilot projects are not truly designed at scale, are not piloted with the most marginalised, are not intended for the economically poorest, and are therefore never likely fully to go to scale and provide a service for everyone. A simple calculation illustrates the issue. Many pilot projects have claimed to show the value of children learning through the use of tablets. In 2015, a UNICEF report noted that

[230] World Bank (2020) Remote learning, EdTech & COVID-19, https://www.worldbank.org/en/topic/edutech/brief/edtech-covid-19; and OECD, World Bank, Global Education Innovation Initiative, hundr*ED* (2020) Lessons for education during the COVID-9 crisis, https://www.worldbank.org/en/topic/edutech/brief/lessons-for-education-during-covid-19-crisis.
[231] Trucano, M. (2020) Zero-rating educational content on the Internet, World Bank Blogs, https://blogs.worldbank.org/edutech/zero-rating-educational-content-internet.

there were then 3 million children out of school in Ethiopia alone. Currently in 2020, a basic tablet suitable for schools costs around UK£50 (€56, ¥456, US$64).[232] Hence, simply to give every out of school child in Ethiopia a tablet would cost £150m, and this level of expenditure would be needed to be repeated every 3-4 years, or possibly more frequently in harsher conditions. This is not a realistic expenditure for a country such as Ethiopia which in 2018 had a national debt of US$ 48,991 million.[233]

The principle of technology neutrality is also fundamentally important. This implies that governments should not commit in policy making or legislation to any one kind of technology, but should rather commit to the educational outcome intended. For example, a government should not insist on delivering fibre to every school, because in many remote contexts it might be cheaper to deliver connectivity through the use of satellites; likewise, solar panels for every school might be more expensive than micro-hydro or wind turbines in some contexts. This principle also extends toward content. It does not make sense to insist on one publisher providing all of the educational content in a country, when using Open Content will usually be of equally good quality and at lower cost (see Guidance Note on OER). Linked to this, though, is also the principle that if a government has funded the development of content, this should always be made available freely to all of that state's citizens (preferably under a Creative Commons open license).

Finally in this section, it is also important to note that so-called "free education" should always be truly free to the end users, the children, and especially so for the poorest and most marginalised. Given the pressures on funding education, it is scarcely surprising that in many countries parents have to pay for school uniform, textbooks and other learning resources, but these payments are often a reason why the poorest parents cannot even afford to pay for "free education".[234] Given the further costs of introducing digital technologies into schools it is therefore very divisive indeed if parents are still expected to pay for that technology, be it devices, connectivity, software or content. The only people really to benefit from this are the companies selling the technologies and the richer pupils.

14.3 Funding this Report's recommendations

It should already be clear from the recommendations in Part II of this Report, that many of them do not require very significant expenditure before they can start making an impact on educational outcomes. This is in part because they are systemic recommendations that seek to ensure an appropriate digital technology response in different educational contexts. Governments need to be thinking about what the educational challenges are that they want to resolve, how much budget they have for a solution, and then explore the most appropriate technologies within that context. As noted several times in this Report, COVID-19 has dramatically reinforced appreciation of the value of longer-established, cheaper technologies such as radio and TV when trying to reach every child with educational opportunities. This implies, for example,

[232] See TechRadar Best school tablets 2020, https://www.techradar.com/uk/best/best-school-tablets,
[233] https://countryeconomy.com/national-debt/ethiopia.
[234] GEM Report (2016) Can Africa afford free education, World Education Blog, https://gemreportunesco.wordpress.com/2016/01/27/can-africa-afford-free-education/.

that when the more privileged return to school, the use of such technologies should persist so that they can continue to be used by those out-of-school.

Applying such arguments to each of the five main groups of recommendations in Part II emphasises that if the vision and commitment are there, and that a realistic approach to the use of digital technologies in education is adopted, some exciting initiatives to make education systems better and more resilient through the use of digital technologies are indeed affordable, especially through the support of wise donors who understand that it is the learning that matters most, rather than the technology.

Much of this section on financing has already emphasised the importance of governments having in place a joined-up and systemic approach to using digital technologies in education, not least in its financing (Section 8). Simply by getting government departments to work more collaboratively together on these issues can help to make the application of digital technologies more affordable and efficient. This requires clear leadership from the top of government. As discussed above, though, Ministries have far too often tended to work separately and apart in delivering digital solutions for their own sectors, sometimes because of personal and professional relationships that have been built up with specific vendors. If an integrated, holistic and cross government approach is adopted, then financial savings can be made that enable delivery to be extended beyond the usual reach of a single department, be it Ministries of Education, Health, or Infrastructure. This also requires effective and transparent tendering processes, which can be extremely challenging especially in the digital technology sector. The education market is seen as being hugely valuable for the private sector, and it is often very difficult for governments to negotiate effectively with large global corporations to achieve what is truly in the best interests of their citizens. This highlights the importance of checks and balances in government, as well as the considerable value of having powerful regulators who have the experience and expertise to negotiate the delicate balance between the "powerful few" and the "weak many" that is so essential if the digital technology sector is to be used in the interests of the poor and marginalised.[235] However, it should also encourage governments to explore open solutions in the education sector rather than focusing only on the latest proprietary technologies. This applies as much to operating systems and software as it does to educational content. The opportunities also to build open regional solutions be they in part of a continent or amongst a group of islands is something that could usefully be pursued further.

A *whole society* approach, the first main set of recommendations of Part II, is also something that is primarily concerned with a change of emphasis and need not be particularly expensive for governments to implement. What it requires most is simply a change of focus, away from being primarily about using digital technologies to facilitate the most able in being even more successful, and towards an approach that begins with the interests of the poorest and most marginalised. Once the principle of equity has been accepted, whereby governments and people recognise and accept the need to pay more to deliver solutions for the most disadvantaged, then completely new ways of "doing business" can come into play. For example, in the early days of

[235] For a detailed discussion for regulation, see Unwin (2017) *Reclaiming Information and Communication Technologies for Development*, Oxford: Oxford University Press.

telephony, the Swedish government and people realised its potential to transform communication, and chose to ensure that as far as possible every community was connected by copper cables. This reflected their traditional communal cultural and social values. Even though it was more expensive to deliver connectivity to isolated communities, this was still largely achieved. In the privatised world of modern telecommunications, such equity principles have rarely been considered, let alone applied successfully, and despite widespread rhetoric of universal access and service delivery, powerful telecommunication companies and service providers have usually tended to focus primarily on the most profitable urban markets, leaving isolated rural areas largely unconnected for years. In their responsibility for delivering education systems for all of their people, governments need to redress this balance, and begin by identifying educational and training practices that deliver for the most marginalised. The example of Plan Ceibal in Uruguay is thus one of the very few initiatives that have explicitly sought to deliver such outcomes, first to the most isolated and marginalised schools, and only then to the rest of their educational establishments.[236] Involving everyone in education and training is also not in itself expensive to implement, but rather requires a realisation that schools alone cannot deliver a total educational package, especially in times of crisis, such as the COVID-19 pandemic. Providing support for parents, families, and communities to deliver or develop appropriate learning outcomes is also something that can be supported at comparatively little expense. Likewise, with regard to technical training for employment, and learning through the complete life cycle, there are excellent opportunities for companies and governments to work together in sustainable partnerships to help ensure that in a rapidly changing world people can acquire the necessary skills to pursue gainful employment throughout their working lives. One of the greatest medium- to long-term impacts of COVID-19 has been on mental health, as most people across the world have dramatically had to change their lifestyles to limit the spread of SARS-CoV-2. Working holistically to make the connections between education and wellness, to integrate medical and educational service delivery, and to focus on the harms as much as the benefits of using digital technologies can all help to build more resilient and sustainable education systems that serve the interests of every citizen at relatively little financial cost.

The greatest need for significant additional expenditure in technology for education initiatives usually comes with the actual provision of digital infrastructure and learning technologies, but even here alternative options can help to reduce the overall direct costs to governments. There are many models and approaches to reducing the costs of providing *digital connectivity and electricity* to enable people to learn throughout their lives both in educational establishments such as schools and colleges, but also beyond them, several of which were mentioned in Sections 10 and 11 of this Report. The first and most obvious one is for governments as a whole to hold companies to account over universal access and service commitments. All too often companies are insufficiently admonished or fined when they do not deliver on their commitments to connect the unconnected. However, governments can do much more to facilitate connectivity, especially through creative uses of the regulatory environment and spectrum licensing agreements. The GSMA, for example, has provided a wealth of policy analysis and recommendations for ways through which governments can support the roll out of connectivity through positive and creative

[236] https://www.ceibal.edu.uy/es.

regulation.[237] Although written primarily in the interests of their private sector members, these studies show very clearly that those countries that have adopted policies that reduce the cost of access by companies to the market, for example by lowering taxation and prices for spectrum, have indeed seen a more rapid spread of digital technologies. Likewise, the GSMA has also provided a series of reports that show how many Universal Service/Access Funds have underperformed, especially in Sub-Saharan Africa.[238] Reform of such funds, rather than their abandonment, could also provide an important avenue for governments to fund the provision of access to digital connectivity for learning by the most marginalised. If they can be made to function more effectively as with the e-rate program in the USA, they can be a valuable means through which governments can have an additional source of revenue explicitly to fund the appropriate use of digital technologies in schools.[239] There are two main funding challenges with connectivity: building the infrastructure, and making it sufficiently affordable for everyone to access and use it. Effective Universal Service Funds may be one way to achieve the former, whilst the latter can in part be addressed by innovative partnerships between governments and operators to deliver learning content for free. If airtime access to sufficient content for a basic core educational curriculum could be made available at no cost to learners this could go a long way to help the most marginalised access appropriate learning resources, and would not be hugely expensive for operators. For those particularly interested in the more restricted challenge of funding school connectivity, the GIGA initiative includes numerous other funding options that can help governments address this.[240] This will not, though, address the needs of the millions of children and young people who are not in schools or colleges.

The third set of recommendations in Part II was around the need for digital technologies and content to be *appropriate to local context*. Again, considerations of financing are central to local context. If the wherewithal is not yet there to pay for Internet-based online learning resources available for all children, then it makes much more sense for governments in the short-term to implement programmes that use older technologies at costs that they can afford to help ensure that their education systems are robust and resilient, and indeed serve the needs of the most marginalised. Even the Broadband Commission's targets indicate that in the short- to medium-term, the "Least Developed Countries" are not going to have sufficient connectivity to provide the basis for widespread online learning: their target for 2025 is that broadband Internet user penetration should reach only 35% of the population in these countries; even the target of 65% in "Developing Countries" means that 35% of their populations will not be Internet users by 2025.[241] To include the poorest and most marginalised within their education systems in these countries now, it is essential to fund appropriate delivery as soon as possible, while planning for a future where connectivity will indeed be much better than this. Funding the development of traditional digital

[237] Most recently, see for example GSMA and Ernst and Young (2020) *Mobile Taxation Studies: Methodology Documentation*, London: GSMA, and they national and regional case studies.
[238] Ladcomm Corporation (2013) *Universal Service Fund Study*, London: GSMA; Ladcomm Corporation (2014) *Sub-Saharan Africa – Universal Service Fund Study*, London: GSMA.
[239] Trucano, M. (2015) Universal Service Funds & connecting schools to the Internet around the world, World Bank Blogs, https://blogs.worldbank.org/edutech/universal-service-funds-connecting-schools-internet-around-world.
[240] GIGA, https://gigaconnect.org/.
[241] Broadband Commission for Sustainable Development (2018) 2025 Targets: "Connecting the other half", https://broadbandcommission.org/Documents/publications/wef2018.pdf.

technologies, not least radio and TV as described elsewhere in this Report, is substantially cheaper and more resilient for providing basic standards of educational delivery in the short-term. Furthermore, strategies that include Open Educational Resources, as well as Free/Libre/Open Source Software (FLOSS) at their heart, can also significantly reduce the costs of delivering and using educational content (see Guidance Note on OER). All governments should also insist that any educational content provided through their funding should be freely available, for example through being marked with a Creative Commons license, and not simply used to increase the profits of companies working in the technology for education sector. The most important thing is that the choice of technology must be context specific. In some countries that already have widespread Internet connectivity and reliable electricity it is indeed feasible to roll out extensive online learning programmes, but even in the richest countries of the world COVID-19 has shown the very significant inequalities in access that exist, and the differential impacts the online learning therefore has on people from different social and economic backgrounds. Governments need to find what works best for the poorest and most marginalised in their countries, and concentrate first on delivering those outcomes. This is often also likely to be much cheaper than implementing an externally designed high cost solution that will still leave many without access to quality learning. Once wider access to digital technologies is available, then the experiences gained to date can then be used to transition smoothly to systems that incorporate more modern and more expensive technologies.

The fourth key theme in Part II was around *appropriate pedagogies and the role of teachers and facilitators*. Two of the central lessons that have been re-learnt as a result of COVID-19 have been that teachers are a crucial part of the education system that cannot (yet) be replaced by machines, and also that teaching styles and methods (pedagogies) must be relevant to the technologies being used. For governments with limited funding available, it is much more important to use this to equip all of their teaching training colleges or institutions, rather than an equivalent number of schools. If all new generations of teachers are trained to use digital technologies appropriately, both inside and outside the classroom, then this will go a long way to improve the quality of learning whilst also helping to ensure resilience. Effective and appropriate in-service training can also be provided through these institutions to develop the professional capabilities of existing teachers. In many instances, well trained teachers can also be a driver for change in their schools, introducing new methods of using appropriate digital technologies, and working with community groups and families to help ensure as wide access as possible to the digital technologies that can be of benefit. Depending on the political climate within a country, it may be possible fundamentally to restructure the rewards and benefits of such training. Increasingly, for example, the costly per diem payments that have been used to encourage participation in professional development training sessions in many African countries have been abused, and there is in any case little strong evidence that these have actually improved performance.[242] If the per diem system was replaced by incentives

[242] Nkamleu, G.B. and Kamgnia, B.D. (2014) Abuses of per diems in Africa: a political economy of travel allowances, African Development Bank Working Paper No. 196, https://www.afdb.org/fileadmin/uploads/afdb/Documents/Publications/Working_Paper_196_-_Uses_and_Abuses_of_Per-diems_in_Africa-_A_Political_Economy_of_Travel_Allowances.pdf. This report, for example, notes that in 2008-9 the government of Tanzania paid US$ 390 million for such allowances, which was equivalent to the annual basic salaries for 109,000 teachers. In 2009-10 the amount allocated to allowances was equal to 59% of the total wage bill.

for achieving excellent learning outcomes for their pupils and students as a result of teachers being trained in the use of digital technologies, then this could well have direct benefits at little overall change in costs. Such incentives might, for example, be in the form of promotions, salary increases, or even supplements and loans to cover the costs of online connectivity and digital devices. Moreover, if teachers are appropriately trained in the use of context specific digital technologies, many of the challenges over their poor use of such technologies during COVID-19 and future such crises could be overcome. It is simply not acceptable for teachers to have to try to teach in the same old ways but using new technologies to do so. They need to be taught the skills to use whatever technologies are most appropriate in their context for helping pupils learn, be it through radio, mobile phones or laptops with high quality and reliable connectivity. Again, making these changes to pre- and in-service teacher training need not be hugely expensive. Furthermore, once teachers are appropriately trained, they will then be able to adapt far more readily to the introduction of the next generation of new technologies that become available to them. It is much better to have teachers prepared for the arrival of the Internet in perhaps five years' time in a particularly isolated school where they are working, than it is for such technologies to be introduced everywhere at great expense without the teachers being prepared.

Finally, governments must ensure that all digital systems are *safe and secure, and that privacy issues* are given the highest priority in implementing digital technology solutions within education systems. It is difficult to estimate the global costs to education systems of digital crime, but it is likely that these are growing in line with similar costs across all sectors.[243] In almost all cases the costs of managing a cyber-crime attack are much higher than those in preventing it, and so investing in appropriate security measures makes sense for all governments. Much of the risk, though, can also be reduced by putting in place effective systems and training, which should be mandatory in all educational systems, and can be done at little or no additional cost. Above all, measures must be taken to protect the privacy of children's and learners' data. This again requires appropriate systems to be in place that need not be expensive to introduce.

14.4 Getting the systems resilient and right: appropriate use of digital technologies in education for the most marginalised may not be as expensive as you think

The above sections have provided pointers to governments as to ways through which education for the most marginalised using digital technologies can be funded. Undoubtedly it is indeed very costly to provide the latest technologies to the most marginalised children living in the most isolated areas. However, it need not always be so expensive to use digital technologies appropriately to enhance the quality of learning for marginalised individuals and communities. This section has highlighted two main reasons why. First, the most important thing is to ensure that appropriate human *systems* are in place within education ministries and schools, to ensure that children can learn wherever they are, and whenever they are able to. Changing the mentalities of all involved to ensure that these systems work effectively need not be

[243] In 2019 it was estimated that cybercrime cost the global economy $2.9 million *every minute*, https://www.infosecurity-magazine.com/news/cybercrime-costs-global-economy/.

more expensive than inefficiently managing the old systems that are currently in place. Second, this section has emphasised that the focus of governments should be *realistic and context specific*. They should use technologies that maximise the access that people have to effective learning within existing government-wide financial constraints. COVID-19 has highlighted just how important radio and TV, for example, remain for many of the world's poorest and most marginalised. This is not at all to suggest that the most marginalised should receive the worst technologies. Far from it. However, it is to emphasise, for example, that ministries of education in most economically poor countries simply cannot afford to roll out high bandwidth connectivity to all of their learners within school and out-of-school. Where bilateral and multilateral donors can also provide funding to support the introduction of new technologies, the speed of change can undoubtedly be increased, but very great care must be taken to ensure that the introduction of such technologies does not further marginalise the already marginalised, and thereby increase yet further the learning inequalities that already exist in most societies. These donors should focus most of their efforts and resources on the most marginalised.

15. Conclusions: digital technologies in the service of equity and inclusion

This Report has been written for senior government officials who have already taken the first step towards creating fairer and better education systems in their countries, and want to know how they can use digital technologies more effectively to deliver that vision under the new conditions prevailing as a result of the COVID-19 pandemic.[244] It is not for those who primarily want to use digital technologies to drive economic growth, and see education systems as a necessary expenditure to ensure that labour is suitably qualified to perform the necessary human tasks within a global economy that is increasingly serving the interests of the few rather than the many. The Report's fundamental aim is to provide a series of recommendations for those government officials who are committed to using digital technologies to create resilient education systems that serve *all* of their citizens, paying particular attention to the needs of the poorest and most marginalised. This is not a task that the private sector can do by itself. Companies that do not make a profit will not survive. Hence, it is only governments, using taxation revenue and other financial mechanisms, that can ensure that those without the ability to pay for the latest digital technologies can in some way benefit from their introduction. Giving every child a tablet will not by itself improve the quality of learning of the poorest and most marginalised, although it will certainly provide increased market share for the companies producing the tablets. Connecting every school to the Internet will not make the slightest difference to the education of the millions of children who do not go to school, yet it will certainly lead to enhanced revenues for the companies making the hardware and providing the connectivity services.

In practice, the alternatives are not quite as stark as the above paragraph might suggest, but governments do need to recognise that invariably digital technologies have been used to create greater inequalities within their states, and that unless they take specific actions to mitigate these then social and political unrest are likely to increase. There are also numerous pressures on governments to sign up to the rhetoric of the "EdTech" sector promoted extensively by private sector companies, many civil society organisations, and numerous bilateral and multilateral donors. This is hard to resist. Such technologies are indeed being used to transform the education sector, and in many ways are doing so for the better, but they do not necessarily improve the learning outcomes for the poorest and most marginalised. This Report is therefore to be read by Ministers and senior officials in part as a counter-balance to much of the over-hyped euphoria associated with the use of digital technologies in education. It draws on extensive consultations, deep knowledge of the relevant literature, and many years of experience, to provide grounded recommendations for how to go about promoting and implementing initiatives that use digital technologies effectively to improve the quantity and quality of learning by the poorest and most marginalised children and adults. The private sector will continue to deliver services

[244] This agenda is closely aligned with some of the arguments within the UN Policy Brief released in August 2020 on *Education during COVID-19 and beyond* (https://www.un.org/sites/un2.un.org/files/sg_policy_brief_covid-19_and_education_august_2020.pdf) especially relating to equity, to the importance of financing and to the potential of digital technologies. However, the recommendations contained within this Report, are more far reaching, and provide much more specific practical suggestions for governments to adopt in delivering those principles.

to those who can afford to pay for them, and as prices become more competitive will gradually reach "the next billion", and then the "next billion". However, by that time "the first billion",[245] those without the ability to pay to use the latest digital technologies to learn, will have become yet further marginalised. It is the responsibility of governments to ensure that this does not happen. It is also the responsibility of donors who believe in inclusive education and the equity principle not to fund digital technology initiatives that merely recycle their currencies back into their own digital technology corporations and consultants, but rather offer these precious resources to support governments in making a real difference that indeed empowers their poorest and most marginalised citizens, alongside the refugees and migrants in their midst.

This Report could have included very many other recommendations, but it has sought to focus only on the five most important areas or themes where governments can have the greatest impact:

1. **A whole society approach: delivering equity in education**
2. **Enabling access: building resilient infrastructures for education**
3. **Being context specific: technologies and content**
4. **Ensuring appropriate pedagogies: the practices of teaching and learning**
5. **Making wise use of technology: security, privacy and data**

Sections 9-13 addressed each of these in turn, highlighting the essential things that governments need to do under each theme. These are all clearly listed and summarised for ease of reference in Annex 2. Underlying all of them is the need for a holistic and integrated approach to the use of digital technologies in education by governments (Section 8), and Annex 3 therefore provides a basic framework indicating the core areas where specific ministries should work collaboratively together to develop appropriate outcomes.

There is no one-size-fits-all answer to how governments should promote and implement initiatives that use digital technologies to improve the learning outcome of the most marginalised, and governments always need to take into consideration their local contexts and priorities. However, in very general terms, the following order of initial priorities and actions is often appropriate:

7. Creating a **long-term cross-party vision** for ensuring that digital technologies are used to enhance learning by the poorest and most marginalised

8. Establishing an **integrated and holistic cross-government team** to deliver that vision

[245] "The first billion" is a term used to emphasise that the poorest and most marginalised are "first" because they are of most importance. It is in deliberate contrast to the pejorative terms "last billion" or "bottom billion".

9. Beginning by ensuring that all **teacher training colleges have as high-quality digital infrastructures as affordable**, and that pre-service and in-service training programmes are implemented to ensure that teachers are trained in appropriate and relevant pedagogies.

10. Prioritising the **specific educational challenges for which digital technologies can have the most significant impact** for the most marginalised in your country (this could, for example, be high numbers of refugees, very dispersed island communities, or numerous minority ethnic groups for whom learning content in the main language is inappropriate).

11. Identifying and **implementing technology-relevant** (in terms of what is both feasible and affordable) **approaches** to resolve these challenges, remembering that low-tech options (such as radio or TV) and Open Educational Resources can often deliver very cost-effective and resilient options, and that multi-sector **partnerships** with the private sector and civil society can be valuable in ensuring appropriateness and sustainability.

12. At all times ensuring that **security, safety and privacy** receive the highest priority in using digital technology for delivering education and training, especially for children and vulnerable adults

As emphasised throughout this Report, the precise order in which the more detailed recommendations are implemented will depend heavily on the character of the existing educational systems, the political will, the levels of funding available, the extent of infrastructural provision (such as school buildings, libraries, electricity, and Internet connectivity), and the geographical size and complexity of the country.

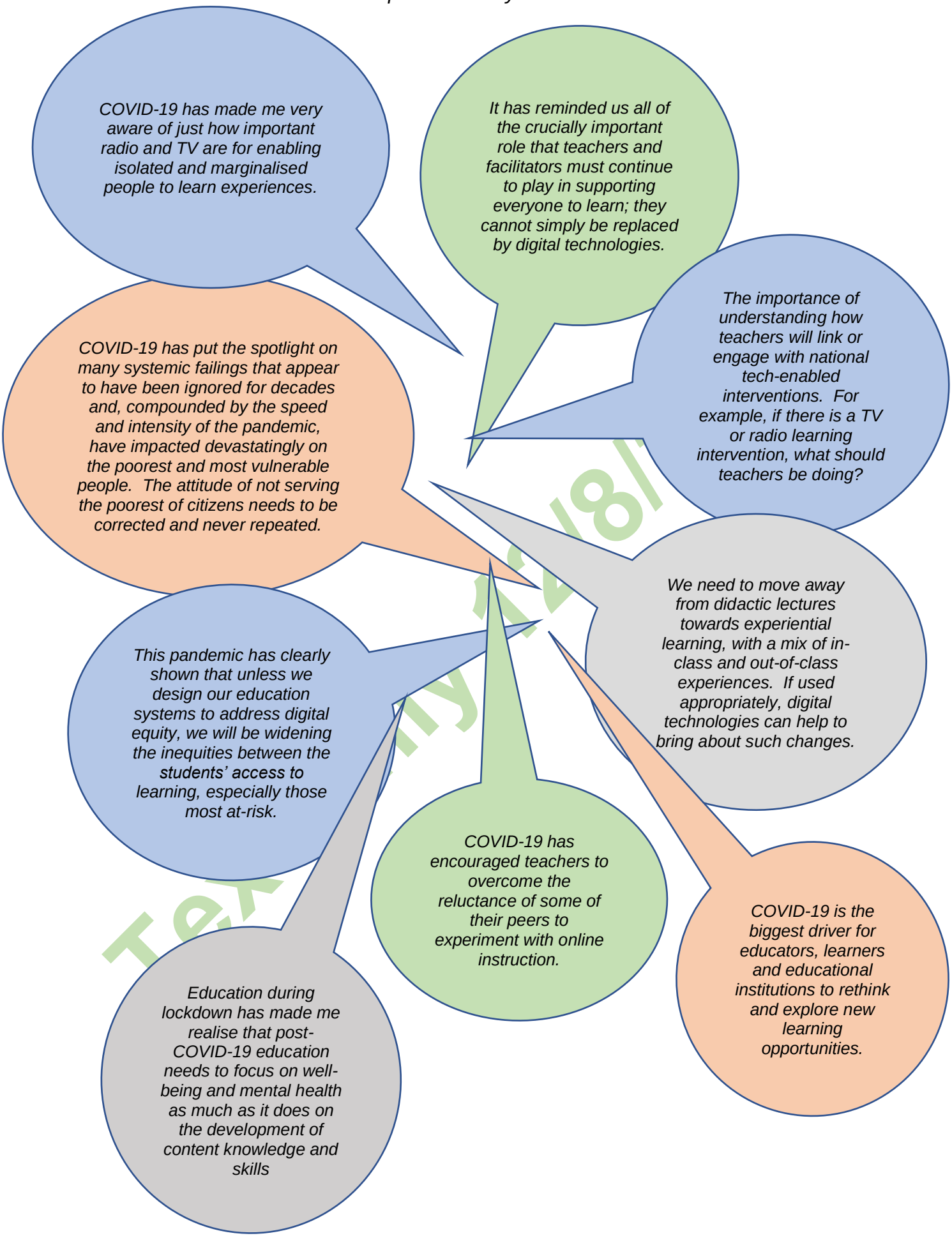
In the meanwhile, longer-term programmes and initiatives should continue to be developed for wider roll-out of appropriate new digital technologies throughout the education sector, drawing on relevant examples of good practices implemented elsewhere, and always remaining cognisant of the unforeseen impact that these may have on inequalities within the national education system.

A couple of basic principles about what not to do also often seem to be forgotten, and should always be remembered:

- Don't put digital technologies into schools without sufficient teachers first being trained in how to use them effectively to enhance learning outcomes; and
- Don't even think about doing pilot projects that are not ultimately designed to be truly inclusive and delivered at scale – otherwise they are never likely to go to scale, and will not be inclusive.

The Guidance Notes in Act Three provide additional short recommendations over and above those contained in this main Report on specific aspects that our consultations and experiences suggest are of particular importance. They are written in a clear and easy to use style, and each provides a short contextual introduction, boxed guidance notes, examples of interesting practices, and further reading. These boxed parts can also be used separately, for example, to make posters for putting on office walls, or for using for training purposes. A sample of infographics and slide decks that can also be made from these Guidance Notes is also provided in Annex 4.

The incentive for producing this Report was the global crisis caused by the COVID-19 pandemic, and its implications for education systems in every country of the world. Rather than being seen only as a catastrophe, we have suggested that this should also be seen as a valuable opportunity to restructure education systems more holistically so that digital technologies do indeed provide inclusive and resilient learning opportunities for *all*, including those who have traditionally been seen as the poorest and most marginalised. To this end, our Report closes with a selection of reflections by members of the core team and advisors on the most important impact that COVID-19 has had on their own thoughts about how the world's poorest and most marginalised can indeed use digital technologies to enhance their learning outcomes, and thus their future life experiences


COVID-19 has made me very aware of just how important radio and TV are for enabling isolated and marginalised people to learn experiences.
It has reminded us all of the crucially important role that teachers and facilitators must continue to play in supporting everyone to learn; they cannot simply be replaced by digital technologies.
The importance of understanding how teachers will link or engage with national tech-enabled interventions. For example, if there is a TV or radio learning intervention, what should teachers be doing?
COVID-19 has put the spotlight on many systemic failings that appear to have been ignored for decades and, compounded by the speed and intensity of the pandemic, have impacted devastatingly on the poorest and most vulnerable people. The attitude of not serving the poorest of citizens needs to be corrected and never repeated.
We need to move away from didactic lectures towards experiential learning, with a mix of in-class and out-of-class experiences. If used appropriately, digital technologies can help to bring about such changes.
This pandemic has clearly shown that unless we design our education systems to address digital equity, we will be widening the inequities between the students' access to learning, especially those most at-risk.
COVID-19 has encouraged teachers to overcome the reluctance of some of their peers to experiment with online instruction.
COVID-19 is the biggest driver for educators, learners and educational institutions to rethink and explore new learning opportunities.
Education during lockdown has made me realise that post-COVID-19 education needs to focus on well-being and mental health as much as it does on the development of content knowledge and skills

Annexes

1. **Summary of methodology and acknowledgements**
2. **Summary of key action points from Part II**
3. **Chart of relevance of different recommendations to specific ministries**

Annex 1

Summary of methodology and acknowledgements

This Report was based on five main sources of evidence:

- The experiences of the core team and advisors as researchers and practitioners in the uses of digital technologies for education by poor and marginalised individuals and communities;
- A substantial literature review, drawing especially on recent literature on the impact of COVID-19 and supported by ongoing work within the EdTech Hub;
- Support and input from leading experts in the field, and relevant UN agencies bilateral donors and governments who especially contributed material to the Guidance Notes;
- An intensive programme of online consultative consensus building exercises; and
- Open review of draft materials online to which anyone could contribute.

The last two of these are summarised in more detail below because of their innovative character so that others who are interested might understand better the processes involved and consider using them when crafting similar consultative and collaborative pieces of work in the future.

The Team

This initiative was led and crafted by a core team consisting of (listed by first name in alphabetical order):

- Dr. Alicja Pawluczuk (UNU Institute in Macau)
- Azra Naseem (Aga Khan University, Pakistan)
- Professor Christopher Yoo (John H. Chestnut Professor of Law, Communication, and Computer & Information Science; Director, Center for Technology, Innovation & Competition, University of Pennsylvania, USA)
- Paul Spiesberger (Chair of ICT4D.at, and Co-Head of BRIC at INSO-TU Wien, Austria)
- Paul West (Creative Commons Chapter, South Africa)
- Prof. Tim Unwin CMG (Chairholder UNESCO Chair in ICT4D and Emeritus Professor of Geography, Royal Holloway, University of London, UK)

This core team was supported by a distinguished panel of advisors:

- Alex Wong (ITU, Switzerland)
- Dr. Bitange Ndemo (ICT Champion and University of Nairobi, Kenya)
- Caroline Wright (DG BESA, UK)
- John Nasasira (Head of 4thIR Task Force, Uganda)
- Keith Krueger (CEO Consortium for School Networking, USA)
- Mike Trucano (World Bank, USA)
- Vanessa Dreier (GIZ, Germany)
- Dr. Waleed Al Ali (Mohammed Bin Rashid Global Initiatives, UAE)

Liaison with the DFID and World Bank Funded EdTech Hub was provided through the participation of the following in the team's work:

- Dr. David Hollow (Team Leader, Jigsaw Consult, and Co-Director of Research EdTech Hub)
- Jamie Proctor (Educational Technology, Foreign, Commonwealth and Development Office, UK)

Additionally, the team was ably supported throughout by

- Dr. Leon Gwaka (University of Pennsylvania, USA)
- Dr.Müge Haseki (University of Pennsylvania, USA)
- Dr. Juliette Unwin (MRC centre for Global Infectious Disease Analysis in the School of Public Health at Imperial College, London) who provided valuable advice on the modelling of COVID-19.

Online consultative consensus building exercises

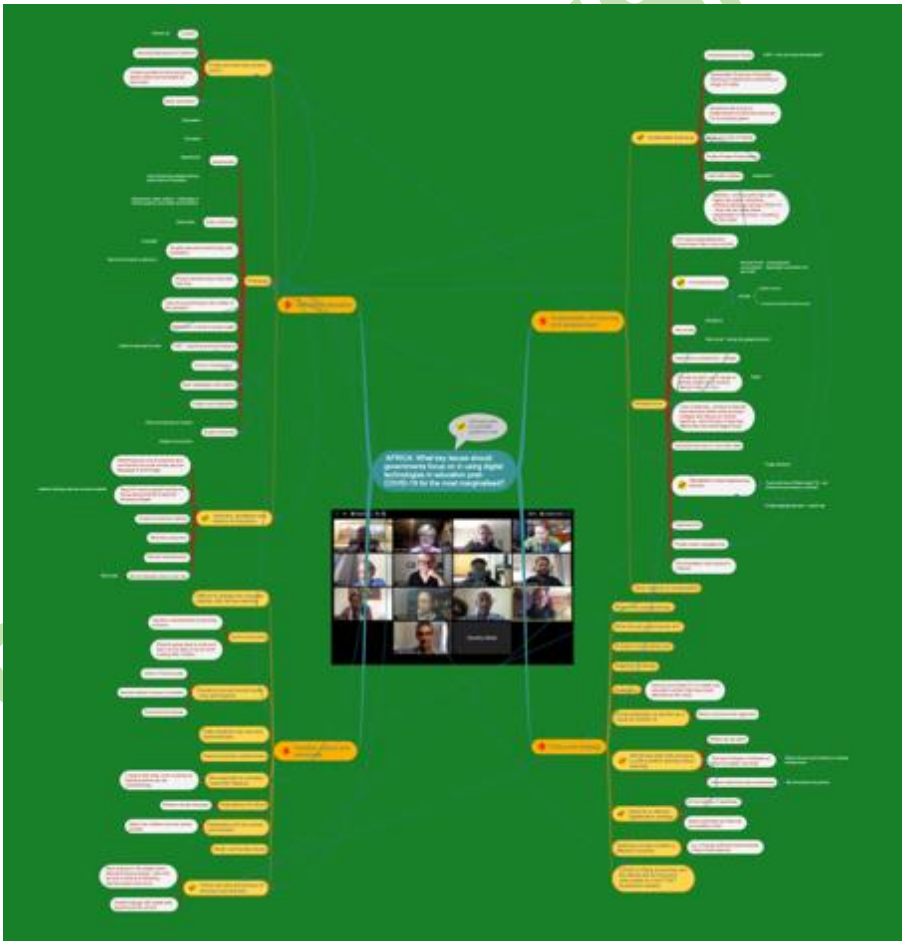
At the heart of the crafting of this report were 9 online consultative consensus building exercises, each of 90 minutes duration that involved in total 43 women and 44 men[1] from 34 countries.[2] The Members of the team and the Advisers recommended people who should be involved in this consultative process based on their understanding and experience of the use of digital technologies in education for the most marginalised, particularly focusing on the role of governments. The explicit intention was to try to ensure as much diversity and expertise within the groups as possible, and participants were invited to participate in the following sessions: Africa; Americas; Asia-Pacific-Middle East; governments; civil society and international organisations; private sector; academics and EdTech Hub members; UN HLCP (High-Level Committee on Programmes) representatives; and UN agencies of direct relevance to this work.

The inclusion of a session for HLCP representatives was for two main reasons: the first was that this methodology was also used successfully in 2018-19 in helping to reach a consensus among 21 UN agencies within the HLCP during the preparation of a report for the UN's Chief Executives Board for Coordination (CEB) on a UN system-wide strategic approach for achieving inclusive, equitable and innovative education and learning for all;[3] and second, that report also provided recommendations concerning the need for governments to be provided with relevant guidance and support in implementing them, particularly with respect to the use of digital technologies.

Participants were informed about the overall aims of the consultation discussions about a week beforehand. Each 90-minute session was held online,[4] and

[1] We are enormously grateful to the following people who gave so generously of their time to contribute to this report and are listed at the end of this Annex. Three of these were unable to participate in the actual consultative workshops, and so were interviewed separately.
[2] The countries represented were: Austria, Belgium, Brazil, Canada, China, Côte d'Ivoire, Ecuador, France, Germany, Ghana, India, Italy, Kenya, Malaysia, Mauritius, Morocco, Namibia, Nepal, Netherlands, Pakistan, Philippines, Puerto Rico, Rwanda, Samoa, Serbia, South Africa, Sri Lanka, Switzerland, Trinidad and Tobago, Uganda, UAE, UK, Uruguay, and USA.
[3] UN CEB (2019) Towards a United Nations system-wide strategic approach for achieving inclusive, equitable and innovative education and learning for all, CEB/2019/1/Add.4, https://digitallibrary.un.org/record/3811332?ln=es.
[4] Using Zoom, https://zoom.us/.

began with a short introduction outlining its purpose. There were subsequently two main parts to each session, which were designed to co-create a mind-map that brought together all of the comments made:[5] first there was a 20 minute brainstorm exercise in which participants were asked to offer short responses to the question "What key issues should governments concentrate on in using digital technologies in education post-COVID-19 for the most marginalised?"; the second part, which lasted for about 70 minutes involved discussions as to how these suggestions could be grouped into around five core themes, and if there was any time remaining, they were encouraged to recommend topics among the list of suggestions for which Guidance Notes should be crafted. The sessions were recorded[6] so that any uncertainties during the live mind-mapping exercise could be clarified subsequently, and there were usually two or three members of the core team listening to each session, but not making any comments until the final few minutes. Immediately following the session, the mind-map was tidied up, and a copy shared with all of the participants within 24 hours for any further comments or input. One example of these (for participants from Africa) is shown below:[7]



[5] ConceptDraw MINDMAP 11.0.0.128, https://www.conceptdraw.com/products/mind-map-software.
[6] All recordings were held in a secure folder on an encrypted drive, and were destroyed following the publication of this Report.
[7] All of the finalised mind-maps are available at https://ict4d.org.uk/technology-and-education-post-covid-19/.

These mind maps provided much of the basic evidence upon which Part II of the report structure was subsequently developed. It had previously been determined through our discussions with government representatives on our team that the Report should try to focus on five main themes. This view was reinforced by comments during the government consultation, which encouraged us to focus only on the most important issues, and to present these as clearly and simply as possible. The high-level categories recommended by each of the consultation groups were then discussed by the team, and eventually it was agreed to group the recommendation under the following five main themes (Sections 9-13 of the Report):

- A whole society approach: delivering equity in education
- Enabling access: building resilient infrastructures for education
- Being context specific: technologies and content
- Appropriate pedagogies: the practices of teaching and learning
- The wise use of technology: security, privacy and data

Two other broader overarching issues had emerged during the team's prior discussion of possible structures, as well as during the consultations, namely the need for governments first to have the commitment and vision to use digital technologies to support learning by the most marginalised, and second questions arising about funding. Hence, Part II begins with Section 8 which addresses the former of these, and Part III begins with Section 14 specifically on funding.

In helping us reach these decisions, we also created the word-map below which provides an overall indication of the frequency with which words word mentioned in all of the mind-maps:[8]

[8] This word-map was developed and prepared by Paul Spiesberger.

The writing and review process

Once the five broad themes had been agreed upon, all of the material within the mind maps was clustered and sub-sections of each main theme were identified. This process included a degree of filtering by members of the team, taking into consideration their experience, the overall focus of the report (on the poorest and most marginalised), and the lessons being learnt during the COVID-19 pandemic. Drafts of each of the three Parts of the report were prepared consecutively, and all members of the team and advisers were invited to comment on them in turn. Once a penultimate draft of each Part had been prepared, these were posted (under the CC BY license) on the UNESCO Chair in ICT4D website at https://ict4d.org.uk/technology-and-education-post-covid-19/, alongside all of the draft Guidance Notes. Those who had contributed to the consultations were once more invited to review the drafts of all of the material, and details of these were also shared through our social media channels using the hashtag #Emmpostcovid19 inviting further comment as well.[9] A final set of revisions was then made in the light of external comments as well as those of the team and advisers, primarily on a "what can't you live with; what can't you live without" basis.

A collaborative initiative: our acknowledgements

Throughout the team has tried to make this as consensual and collaborative a process as possible, involving a wide variety of people from different backgrounds across the world. We have also sought to give recognition to all those who have helped and led on particular parts of the project, and these are acknowledged in the footnotes pertinent to each section, and in the Guidance Notes. To conclude this Annex, we wish to reiterate our thanks to the 87 people from 34 countries outside the core team and our advisers who have contributed to this work, omitting only those who requested anonymity. We also stress that these people have contributed in their own personal capacities, and the views expressed in our Report do not necessarily agree with those of their organisations.

Agnes Chigona	CPUT, South Africa
Ahmed Saïd Bah	ISESCO cooperation office
Akber Gardezi	COMSATS University, Islamabad Pakistan
Alexa Joyce	Microsoft
Alexandre Barbosa	Center of Studies for Information and Communications Technologies (CETIC.br), Brazil
Andaleeb Alam	UNICEF
Andy Beard	Vanu, USA
Anita Ghimire	Director, Nepal Institute for Social and Environmental Research, Nepal
Annantha Duraiappah	Director of the UNESCO Mahatma Gandhi Institute of Education for Peace and Sustainable Development, India
Asha Kanwar	COL
Alex Wong	Consultant ITU
Björn Hassler	Cambridge, EdTech Hub, UK
Borhene Chakroun	Director Division for Policies and Lifelong Learning Solutions, UNESCO

[9] As of 21st August 2020, 487 people had viewed the material, and many of their comments have been incorporated into various drafts of the text. Part 1 had been downloaded 173 times, Part III 162 times, and five of the Guidance Notes had each been downloaded more than 100 times.

Boying Lallana	ideacorp, Philippines
Carla Licciardello	Digital Inclusion Coordinator, ITU.
Caroline Pontefract	Director of Education, UNRWA
Chetan Choudhury	Prime Minister's Office, UAE
Cris Seecheran	MD ICT Plus, Trinidad and Tobago
Cristina Petracchi	FAO
Dan Wagner	UNESCO Chair in Learning and Literacy, University of Pennsylvania, USA
Danny Gauch	CEO WorldDidac
Dato' Sharil Tarmizi	OPCOM Chairman; former Regulator MCMC, Malaysia
David Campbell	Director Mediae, Kenya
Dimitrios Vlachopoulos	Program Manager, Educational Technology for Social Change Amsterdam University of Applied Sciences, Netherlands
Dorothy Okello	School of Engineering, Makerere University, and WOUGNET, Uganda
Eddie Ralston	Whizz Education, UK.
Elida Reci	UN-DESA
Elspeth McOmish	UNESCO
Emma Kruse Vaai	Former Deputy Vice Chancellor of National University of Samoa and CEO of Samoa Qualifications Authority, Samoa.
Eric White	World Economic Forum
Florencia Ripani	Fundación Ceibal, Uruguay
Frank McCosker	Global Good Net Works, UK
Gavin Dykes	Cellcove, UK
Gema Jara	CommonLit
Haif Bannayan	International Baccalaureate Organization
Halima Letamo	ITU
Helen Crompton	Old Dominion University, USA
Helena Pylvainen	UNRWA, Senior Education Programme Specialist
Irfan Ahmed Awan	Society for Community Strengthening and Promotion of Education, Balochistan, Pakistan
Jacqueline Strecker	UNHCR
Jane Mann	Cambridge University Press, UK
Janet Longmore	Founder and CEO Digital Opportunity Trust, Canada
Javier Rua-Jovet	Puerto Rico
Jim Wynn	Imagine Education, UK
John Traxler	University of Wolverhampton, UK
Jongwhi Park	UNESCO Institute for Lifelong Learning
Joseph Nsengimana	Mastercard Foundation, Rwanda
Joseph South	International Society for Technology in Education
Joshua Mallet	Education consultant in ICT for skills enhancement, Ghana
Juan-Pablo Giraldo Ospino	UNICEF
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Julia Pilgrim	UNODC
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Lutz Ziob	Ziob consulting
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Maiko Nakagaki	Web Foundation
Marco Zennaro	ICTP, Italy
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Mark West	UNESCO
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Nnenna Nwakanma	WWW Foundation
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Paul Prinsloo	UNISA
Penelope Bender	Head of Global Education Services, Burda Education
Philippe Mero	EvidenceB, France
Revi Sterling	DAI/USAID, USA
Ricardo Sabates	Cambridge University, UK
Romeela Mohee	Former Education Specialist, Higher Education, COL, Canada.
Russell Southwood	Balancing Act, UK
Sebastian Nieto Parra	OECD Development Centre
Shafika Isaacs	Consultant, South Africa
Silvana Cordero Carrasco	AI4Equality, Ecuador
Srinivas Reddy	ILO
Sujata Gamage	LIRNEasia, Sri Lanka
Susan Teltscher	ITU
Svenia Bussin	European EdTech Network
Vignesh Ilaravasan	IIT Delhi, India
Violette Uwamutara	Digital Opportunity Trust Rwanda
Wallace Chigona	UCT, South Africa
Wang Qiong	GSE Peking University, China

Annex 2

Summary of key action points from Part II

This Annex pulls together in bullet point format the main issues raised under each subsection of Part II, thereby summarising the key action points for governments in delivering effective and resilient use of digital technologies for learning by the most marginalised. It serves as a checklist for necessary action, and each part can be developed separately to provide posters, infographics and slide-decks for use by government officials and others (see also Annex 4).

The five most important things for governments to get right in using digital technologies for education and learning by the most marginalised

1. A whole society approach: delivering equity in education (Section 9)

1.1. Adhering to the principle of equity in education: serving the most marginalised
- Understanding the difference between equity and equality
- Allocation of resources to those most in need

1.2. Recognising and supporting the role of families and communities: we all teach, and we all learn
- Parents and grandparents as teachers
- Recognition of the importance of lifelong and lifewide learning
- Context matters
- Learning after leaving school
- Spaces for learning

1.3. Working constructively with the private sector
- Governments learning to work with the private sector
- Provision of learning for work
- Flexible approaches to engaging with the private sector
- Multi-sector partnerships

1.4. Using digital technologies effectively to support employment and training for work
- Ensuring skills and knowledge for work
- Vocational training as integral to the education system
- Innovative use of digital technologies for employment-related training

1.5. Creating learning environments that promote wellness and wellbeing
- Lessons from COVID-19 for wellness and well-being
- Use of digital technologies to support wellness and well-being, especially for the most vulnerable
- Mitigating the abuse of digital technologies to cause harm

1.6. Involving learners in educational decision making at appropriate levels
- Digital technologies involving the hard-to-reach in learning
- Learner engagement in crafting their own learning.

2. Enabling access for all: building appropriate resilient infrastructures for education (Section 10)

2.1. Providing digital connectivity beyond schools: ensuring resilience
- Learning at all times and in all places
- Electricity and Internet connectivity
- Alternative ways through which to deliver distance education
- Instructional and technical teacher support
- Creating safe and convenient learning environments

2.2. Connecting schools: access to the electricity and Internet
- The most marginalised are often off-grid
- Supporting renewable energy provision
- Alternative means of providing Internet connectivity
- Working with service providers

2.3. Creating innovative opportunities for achieving access for the most marginalised
- Lack of electricity
- Lack of devices
- Low levels of digital literacy
- Relevant content

2.4. Crafting infrastructures for lifelong and lifewide learning
- Creating flexible options
- The potential of Open Sources software
- Privacy and security

2.5. Leveraging global infrastructure initiatives involving the private sector and civil society
- Connecting global initiatives with local solutions

3. Being context specific: technologies and content (Section 11)

3.1. Understanding the contexts of marginalisation
- Marginalisation as a process
- Spatial and socio-cultural marginalisation
- Identifying the local context of marginalisation

3.2. Being technology agnostic: balancing old and future technologies
- Using appropriate technologies on context
- Being technologically agnostic: not placing all investment into a specific technology that will become outdated
- Total cost of ownership

3.3. Using appropriate devices
- Using older technologies where they remain optimal
- The value of radio and television
- Crafting the appropriate legislation
- Enabling flexible design for delivery
- Ensuring an essential core curriculum to be delivered for everyone in any circumstance

3.4. Developing a relevant curriculum
- Context appropriate and relevant curriculum
- Legislating for nation-wide curriculum

- Fluidity in curriculum design through use of digital technologies
- Limited core curriculum to be delivered in all circumstances

3.5. Ensuring appropriate content and platforms for learning
- National strategies for content delivery
- Digital technologies enabling content provision
- Open Educational Resources (OER)
- Multiple languages
- Curriculum relevant content
- Use of diverse formats
- Not all content can be made available online
- The potential of AI for personalised learning
- Digital content must be teacher/facilitator friendly

4. Ensuring appropriate pedagogies: the practices of teaching and learning (Section 12)

4.1. Ensuring appropriate pedagogies
- Pedagogy as the theory and practice of learning
- Didactic and constructivist approaches to teaching and learning

4.2. Crafting flexible practices
- The technology must match the pedagogy
- Pedagogies and technologies should be appropriate to the context of learning
- The interplay between pedagogy and technology should be resilient and robust

4.3. Empowering teachers, trainers and facilitators
- Effective and relevant pre- and in-service teacher training
- Teaching through digital technologies
- Involving school leaders and administrators
- Ensuring sufficient support is available for teachers
- Working with learning facilitators

4.4. Enabling pathways for learner progression
- Engaging marginalised people with formal qualifications pathways
- The value of learning portfolios
- Ensuring flexibility within the system

4.5. Requiring appropriate assessment schemes
- Summative and formative assessment
- Assessing appropriate skills and knowledge
- Improving assessment systems through the use of digital technologies
- Self-learning through automated assessment
- Ensuring all assessment schemes are relevant and appropriate
- Linkages between assessment and certification

4.6. Ensuring learning for all
- Flexible modes of teaching and learning to ensure universal education

5. Making wise use of technology: security, privacy and data (Section 13)

5.1. Ensuring the safety of everyone involved in education and learning
- All learners trained in using digital technologies safely
- Use of multiple languages

- Enacting appropriate legislation
- The use of helplines
- Effective policing

5.2. Promoting the security of systems
- Balancing centralised and decentralised systems
- The most common threats
- Where to find relevant advice

5.3. Caring about privacy
- Balancing security and privacy
- The ethics of privacy and confidentiality in education systems
- Involving society within decision making
- Choosing the precautionary principle when in doubt

5.4. Managing data appropriately
- Ethical issues around data analytics
- Data analytics improving teaching and learning
- The sale of student data?
- The role of the private sector

5.5. Effective monitoring and evaluation
- Involving multiple approaches, combining qualitative as well as quantitative methods.
- Being wary of biases in review processes
- Need to focus on monitoring educational outcomes more than evaluating technological inputs
- Effective monitoring and evaluation are not cheap but are worth doing to enhance education systems

Annex 3

Roles of different government Ministries and Departments in delivering the Report's recommendations

Ministry/ Department	Core themes							Guidance Notes														
	Vision/strategy	Whole society approach	Enabling access	Context specific	Appropriate pedagogies	Wise use of technology	Funding	Local context	OER	Girls' education	People with disabilities	Refugees and displaced persons	SIDS	Resilient connectivity	Energy solutions	Learners' voices	Teacher training	Vocational training	Monitoring and evaluation	Safety	Partnerships	
President/ Prime Minister's Office	●	●	●	●	●	●	●															
Ministries																						
Education Ministry	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
Finance Ministry	●		●	●		●	●							●	●					●		
Health and Welfare Ministry	●	●		●		●				●	●	●				●						
ICT/ Telecommunications Ministry	●	●	●	●	●	●	●	●					●	●	●				●	●	●	
Infrastructure Ministry	●	●	●			●		●					●	●	●							
Labour/Employment Ministry	●	●			●	●											●	●				
Planning Ministry	●	●	●			●	●						●					●	●			
Security/Internal Affairs Ministry	●	●	●			●						●										
Regulators																						

ICT/Telecom Regulator	●	●	●	●		●	●		●				●								●	
Media Regulator	●	●	●	●		●	●		●												●	

● Main lead
● Close involvement

Education for the Most Marginalised post-COVID-19:
Guidance for governments on the use of digital technologies in education

Act Three: Guidance Notes

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with
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About this document

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License

Authorship

This report is the outcome of a collaborative authorship initiative and widespread consultation, full details of which are given in Act 2: Annex 1. The lead author and overall editor unless otherwise indicated was Tim Unwin, but all authors as well as members of the team's advisory board contributed extensively to the crafting of this final Report.

Version

Version 3.0

A Report in Three Acts

This Report contains three separate documents (Acts), each of which can be read and used independently. The first is intended for senior government officials and contains a summary of the Report's main recommendations. Act Two provides the detailed exposition, arguments and evidence upon which these recommendations are based, and is intended primarily for those in government who are charged with implementing them. Act Three contains 14 Guidance Notes which provide succinct guidance on delivering important aspects of the overall Report.

The word "Act" (deriving from Latin *Actus*, meaning an event or something done) has been chosen specifically as a reminder that we must all take ***act***ion if the poorest and most marginalised are indeed to benefit from the use of digital technologies in education and learning. It is of course also a reminder that the act of writing it is finished, and that it must now be performed for it to come into effect, as in a theatrical play on the world stage.

Languages

This Report is being made available in the first instance in English and French, but we encourage and welcome its translation into other languages.

Recommended citation

Unwin, T., Naseem, A., Pawluczuk, A., Shareef, M., Spiesberger, P., West, P. and Yoo, C. (2020) *Education for the Most Marginalised post-COVID-19: Guidance for Governments on the Use of Digital Technologies in Education. Act Two: Report*. London: EdTech Hub. DOI****

License

Guidance Notes

This final Act of this Report includes 14 Guidance Notes that provide focused advice for governments on some of the most important specific issues where effective and appropriate interventions using digital technologies can help significantly to increase equity and resilience in education systems.[255] These are largely based on the suggestions of those involved in our consultations, and are an integral part of this Report. However, they can also be used separately by stakeholders who would like guidance on the most important actions that must be undertaken and delivered. Each of them contains an introductory contextual section followed by relevant guidance in a boxed format that can be adapted in whatever ways are most relevant. They can, for example, be used to craft infographics or slide decks (see Annex 4), turned into posters, or simply used as reminders pinned above a desk. Much of this guidance is in the form of "what needs to be done". Given the emphasis of the Report that context matters and there is no such thing as "one size fits all", these recommendations also usually do not suggest precisely how governments should go about doing them. It would be presumptuous to do so. Instead, each Guidance Note also includes examples of how they have been achieved elsewhere (including things that should *not* be done), and a short selection of further reading that can provide suggestions for ways through which others have thought about or tried to achieve these outcomes.

The Guidance Notes are grouped into five main clusters (listed in alphabetical order):

Content
- In the local context – using digital technologies to develop local content
- Sharing Open Educational Resources (OER) with Creative Commons (CC) open licenses

Including the poorest and most marginalised
- Digital technologies and girls' education
- Inclusion and accessible learning for people with disabilities
- Supporting the effective use of digital technologies for learning by refugees and displaced persons
- Digital technologies and education in Small Island Developing States (SIDS)

Infrastructural issues
- Ensuring resilient connectivity
- Resilient and sustainable energy solutions

Pedagogies
- Involving marginalised young people in the design of their own education
- Prioritising effective and appropriate teacher training
- Using digital technologies effectively in support of vocational learning and training

[255] Further Guidance Notes will be developed and shared in due course in response to demand and our continuing work on these issues. These updates and additions will be made available on our site at https://ict4d.org.uk/technology-and-education-post-covid-19/.

Learning safely and effectively together

- Ensuring rigorous monitoring and evaluation of initiatives using digital technologies in education for the most marginalised
- Ensuring that children are safe when using digital technologies for learning
- Partnerships with the private sector and civil society

All of the Guidance Notes are to some extent cross-cutting, reflecting the holistic framing of this Report. However, they are usually of most relevance to one of the main core themes of this report as indicate below:

Guidance Notes	**The five core themes of Part II of the Report**				
	Whole society approach	**Enabling access**	**Context specific**	**Appropriate pedagogies**	**Wise use of technology**
Content					
Contextualised content	●		●	●	
OER			●	●	●
Including the poorest and most marginalised					
Girls' education			●	●	●
People with disabilities			●	●	●
Refugees			●	●	●
SIDS		●	●	●	●
Infrastructural issues					
Resilient connectivity	●	●	●		●
Sustainable energy		●	●		
Pedagogies					
Learners voices	●			●	●
Teacher training			●	●	●
Vocational Training	●		●	●	
Learning safely and effectively together					
Monitoring and evaluation	●	●	●	●	●
Digital safety	●		●	●	●
Partnerships	●		●	●	●

● Of most relevance
● Highly relevant

Guidance note: In the local context - using digital technologies to develop local content [1]

Context

This Report has stressed throughout the importance of providing learning opportunities that are relevant to the local context, especially for the poorest and most marginalised. There is, though, a very considerable debate about the pros and cons of delivering education in international languages or in learners' mother tongues.[2] Different countries have adopted varying stances towards this contentious issue, with many trying to combine both mother-tongue and international languages at different stages in the curriculum. Language of education is not only a remnant of colonial pasts, and a vehicle for continuing neo-imperialism, but it is also highly politically sensitive in the context of contemporary nation building, especially in countries that have multiple languages.[3] The practicalities and costs are also immensely challenging in providing educational content in multiple languages. This is especially so in countries such as Ethiopia which has some 86 languages, let alone Papua New Guinea with 840 or so living languages. Using digital technologies to provide online content translated into multiple languages, or videos that can be listened to in the mother-tongue or using sub-titles, can nevertheless be of considerable help in overcoming such challenges in cost effective ways, especially when developed as Open Educational Resources (see Guidance Note on OER).

Nevertheless, learning effectively in a local context goes far beyond just translating the languages in which text is written, and much remains to be done in ensuring that online content is truly context specific. Learning videos of completely alien worlds that are merely voiced-over in local languages can thus remain of little real meaning to a child who has no experience or understanding of the things depicted. Likewise, using an illustrated wall chart or online alphabet to describe letters in English can be challenging for a child living in a semi-arid area far from any lakes or the sea, when, for example, the letter Y is depicted by a yacht. It is therefore essential that governments build into their educational policies clear requirements for all online content developed for, and used in, schools to be produced in locally context specific ways. Furthermore, language and culture are also means through which people from certain communities are marginalised by dominant cultures, and therefore particular care and attention needs to be taken to ensure that the development of digital learning content does not actually further marginalise people from these communities.

[1] Lead authors Azra Naseem, Waleed Al Ali, and Tim Unwin.

[2] See, for example, Rutu Foundation, https://www.rutufoundation.org/; UNESCO (2016) If you don't understand how can you learn? *GEM Report Policy Paper 24*, https://unesdoc.unesco.org/ark:/48223/pf0000243713; UNESCO (2018) UNESCO celebrates the power of mother languages to build peace and sustainability, https://en.unesco.org/news/unesco-celebrates-power-mother-languages-build-peace-and-sustainability;

[3] At the time of writing, the very popular Khan Academy materials, for example, are only available in 16 localized platforms, most of which are in European languages, https://support.khanacademy.org/hc/en-us/articles/226457308-Is-Khan-Academy-available-in-other-languages-.

At least five key context-related issues need to be considered by governments committed to delivering a vision of equity when using digital technologies in their education systems:

- It is important that the use of literacies such as reading and writing (and even digital literacy) that are valued by certain dominant cultures, do not undermine other literacies, such as speaking and listening, that are valued in local contexts, especially by already marginalised communities.
- Using inappropriate images and concepts in textbooks and online resources that children find it difficult to relate to can negatively influence their motivation to learn. Teachers will also struggle to teach a curriculum that is neither meaningful to them or their pupils.
- Using only culturally alien digital content will mean that children will grow up without understanding their own cultural heritage and the issues that are of most importance to their own context.
- Learners may well develop identity problems and poor self-image, when comparing their own lives with those represented in alien content that is borrowed (or imposed) from a non-local context and curriculum.
- Increased dominance of a few main "global" or "international" languages used in digital content is leading to the loss of the cultural heritage embedded in dying local languages.[4]

Guidance

The guidance below highlights the main areas where governments and education regulators can act to enhance usage of locally and contextually relevant digital content:

1. Governments should ensure that **mechanisms are in place to check that all digital content used to deliver the national curriculum in schools (public and private) is culturally and locally contextually appropriate.** This is especially so when existing material from outside the country is translated into local languages
2. All government funded digital learning **content should include culturally appropriate visual material and examples, that fully represent the diversity of local culture**, and should be make available in formats that teachers and children can access on locally available devices.
3. **Teachers should be encouraged throughout their professional training to develop and share locally developed content** (see also Guidance Note on OER), and where relevant should also include learners in such content development (see also Guidance Note on involving learners).
4. Where relevant, curriculum developers and **teachers should be encouraged to use project- and portfolio-based learning and assessment, which contextualise the teaching and learning process** and can also be used to help solve local problems within their communities.
5. **Digital content that has been locally developed by teachers and learners should be made available through regional repositories established and maintained by governments**. Not only will this build a critical mass of pertinent contextual content, but it will also increase teacher and student motivation.

[4] See, for example, UNESCO (2010) *Atlas of the World's Languages in Danger*, Paris: UNESCO, 3rd edition, http://www.unesco.org/languages-atlas/,

Examples.

The following examples highlight the importance of locally contextual content:

- Free Linguistics Conference Group (FLC Group), providing a range of services to support and empower indigenous and minority languages and communities worldwide, http://www.flcgroup.net/
- Let's Read, by the Asia Foundation: https://asiafoundation.org/what-we-do/books-for-asia/lets-read/. Providing digital books for children in Asia in their own languages.
- Madrasa.org: https://madrasa.org/. E-Learning platform providing 5,000 free Arabised educational videos in science, math, biology, chemistry, physics and Arabic language subjects that cater to students from kindergarten to grade 12.[5]
- Onebillion: https://onebillion.org – provides mother tongue literacy and numeracy education. Its Onecourse numeracy material is provided in 50 languages.
- ToffeeTV – songs, stories and activities for children in Urdu, https://toffeetv.com/category/songs/

Suggested further reading

- Benson, C. (2004) The importance of mother tongue-based schooling for educational quality, UNESCO Background paper prepared for the Education for All Global Monitoring Report 2005, https://unesdoc.unesco.org/ark:/48223/pf0000146632.
- Brown, J. S., Collins, A., Duguid,P. (1989) Situated cognition and the culture of learning, *Educational Researcher*, 18: 32-42.
- Daniel, J. (2003) The mother tongue dilemma, *Education Today*, UNESCO, https://unesdoc.unesco.org/ark:/48223/pf0000130800.
- Malone, S. (2018) *MTB MLE Resource Kit: Including the Exc luded: Promoting Multilingual Education*, Paris: UNESCO, https://unesdoc.unesco.org/ark:/48223/pf0000246278.
- Wolfenden, F. and Adinolfi, L. (2019) An exploration of agency in the localisation of open educational resources for teacher development, *Learning, Media and Technology*, 44(3): 327-344, https://www.tandfonline.com/doi/full/10.1080/17439884.2019.1628046?casa_token=pk3lVWoGJQ8AAAAA%3AFVTyLxi3cr4QtnksLaAw3HYhPYDxmgyArchLGJY2XBuOAnCDjoThteN8wVG5km24O3f9QJDCww.

[5] FCSA (2020) *Policy in Action. Madrasa: UAE's global classroom initiative,* UAE: FCSA, https://fcsa.gov.ae/en-us/Lists/D_Reports/Attachments/25/En%20Madrasa%20New2020.pdf.

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Guidance note: Sharing Open Educational Resources (OER) with Creative Commons (CC) open licenses [1]

Context

Open Educational Resources (OER) are an important means through which governments and educators can promote, develop and share educational materials, resources and content beyond the traditional proprietary publishing model.

The sharing of content has a long history[2] and learning materials were being shared well before the term OER was coined in an online forum hosted by UNESCO on the Impact of Open Courseware for Higher Education in Developing Countries and Creative Commons released its open copyright licenses in 2002.[3] Open Educational Resources (OER) are teaching, learning, and research materials that are either (a) in the public domain or (b) licensed in a manner that provides everyone with free and perpetual permission to engage in the 5R activities (Retain, Reuse, Revise, Remix, Redistribute).[4]

OER are quality educational materials that are freely and openly licensed, and are available online to anyone, anytime. The creation of OER is usually funded by governments or donors and the resultant products are released under a Creative Commons open license or directly into the public domain.[5] OER may be developed by volunteers provided that all contributions are properly recognised.

OER are customisable or 're-mixable' which requires that the editable, underlying digital assets are made available to enable others to adapt the works.

OER have benefits for governments since they:[6]

1. **Reduce student costs**: Textbook prices are rising rapidly and OER publishing models offer a way to contain such increases.[7]
2. **Support student success and retention**: OERs can help ensure that every student in a course has access to course material.
3. **Innovate teaching practices**: Adapting, adopting, or creating OER gives teachers the opportunity to customise course content, allowing them to provide innovative, optimized learning experiences and environments for students. OER supports open pedagogy and open education. Examples include:
    - Open Pedagogy[8]
    - Open Education Group[9]
    - Read the 7 Things You Should Know About Open Education: Practices[10]

[1] Lead authors Paul West, Tim Unwin and Cable Green.
[2] https://www.ubiquitypress.com/site/chapters/10.5334/bbc.b/download/590/
[3] https://tinyurl.com/y9h8yfvf
[4] See further below, and https://creativecommons.org/about/program-areas/education-oer/
[5] https://creativecommons.org/publicdomain/zero/1.0/
[6] Adapted from: Open Educational Resources (OER): OER Benefits and Challenges, Maureen and Mike Mansfield Library, https://libguides.lib.umt.edu/oer
[7] https://www.insidehighered.com/news/2014/01/28/textbook-prices-still-crippling-students-report-says
[8] https://opencontent.org/blog/archives/2975
[9] http://openedgroup.org/oer-enabled-pedagogy
[10] https://library.educause.edu/resources/2018/7/7-things-you-should-know-about-open-education-practices

4. **Exercise academic freedom**: Teachers may edit, revise, and modify OER as they like. True OER permits adaptations (see the 5R's).[11]
5. **Enrich scholarship**: If teachers share learning materials, simulations, tutorials, and textbooks, it gives fellow teachers more options for their own teaching and learning. The more pedagogical strategies and content available for teaching a topic, the stronger the teaching and learning can be.
6. **Support for International Policies**: UNESCO SDGs[12] (Goal 4 in particular), UNESCO OER Recommendation[13] and the Open Government Partnership.[14]

What are the benefits of requiring open licenses on publicly funded resources?[15]

1. Government increases the impact, reach and scalability of its grants and contracts.
2. Government creates conditions for maximum potential value created from all resources it funds, more efficiency and better stewardship of public funds.
3. The public has access to the educational resources it funded.
4. Innovative and entrepreneurial uses of openly licensed materials are enabled.
5. Resources are available for anyone to reuse and add value, including individual citizens, educators, scientists, public sector employees, entrepreneurs and commercial businesses.

Guidance

When implementing OER in education, it is useful for governments to consider the following aspects:

1. Openly license and freely **share** all publicly funded works using Creative Commons licenses which are considered the global standard for open content licenses and are interoperable and make content remixable.
2. Work systematically to fulfil areas of action in the **UNESCO Recommendation** on OER and the **5Rs.**[16]
3. Learn about and set a **default** Creative Commons (CC) license (usually CC-BY or CC-BY-SA) to be included on all shared works.[17]
4. Ensure all **CC licensed works** are appropriately attributed using the **TASL** format (Title, Author, Source, and License).[18]
5. Establish institutional **OER policies** that support educators using and sharing OER.[19]
6. Establish a process to approve a **more restrictive CC license** for a work should one be required.
7. Enforce the open licensing and sharing of all public and donor funded works.

[11] http://opencontent.org/definition/
[12] https://en.unesco.org/sustainabledevelopmentgoals
[13] https://en.unesco.org/themes/building-knowledge-societies/oer/recommendation
[14] https://www.opengovpartnership.org/stories/how-open-educational-resources-can-help-ogp-initiatives/
[15] https://www.thecommonwealth-educationhub.net/oer/
[16] http://opencontent.org/definition/
[17] https://creativecommons.org/publicdomain/zero/1.0/
[18] https://tinyurl.com/y9h8yfvf
[19] https://creativecommons.org/about/program-areas/education-oer/

8. Refer questions about CC open licenses, open education policies, and the implementation of the UNESCO Recommendations on OER to Creative Commons: cable@creativecommons.org and info@creativecommons.org.

A note on terminology

There are various definitions of OER that have evolved over the past approximately 20 years. A widely respected definition is provided by Creative Commons:[20]

Open Educational Resources (OER) are teaching, learning, and research materials that are either (a) in the public domain or (b) licensed in a manner that provides everyone with free and perpetual permission to engage in the 5R activities.

In particular, anyone must be able to perform all the following actions with OER:

1. **Retain** – make, own, and control a copy of the resource
2. **Reuse** – use your original, revised, or remixed copy of the resource publicly
3. **Revise** – edit, adapt, and modify your copy of the resource
4. **Remix** – combine your original or revised copy of the resource with other existing material to create something new
5. **Redistribute** – share copies of your original, revised, or remixed copy of the resource with others

Examples

- OER Policy Registry: https://oerworldmap.org/oerpolicies
- Open Content: http://opencontent.org/
- Open Education Practices: https://tinyurl.com/y8oxyqqb

Suggested further reading

- Policy Brief on Open Educational Resources, https://www.thecommonwealth-educationhub.net/oer/
- Government Support for Open Educational Resources: Policy, Funding, and Strategies, http://www.irrodl.org/index.php/irrodl/article/view/1537/2481
- Creative Commons license compatibility, https://creativecommons.org/faq/#can-i-combine-material-under-different-creative-commons-licenses-in-my-work
- Creative Commons Certificate course, https://certificates.creativecommons.org/

[20] https://wiki.creativecommons.org/wiki/What_is_OER%3F

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Guidance note: Digital technologies and girls' education [1]

Context

There has long been growing concern about the imbalances between men and women's access to digital technologies, and their engagement in the tech sector at all levels. However, progress is being made in innovative ways to use digital technologies to reduce these inequalities. There have thus been numerous local initiatives to help girls learn to code, as well as increasing global attention to redress the trend towards increasing gender digital inequalities.[2] Some recent evidence also suggests that providing access to technology can also have a disproportionately positive impact on empowering girls relative to boys.[3] To date, though, such initiatives have not yet made a fundamental change to the gender inequalities that exist in many countries surrounding women and technology.[4] In large part this is because they are an expression of far deeper social and cultural structures, and unless these are changed the increasing use of digital technologies – as accelerators – will serve to increase rather than reduce such inequalities.

This guidance note therefore encourages governments to adopt a three-pronged approach: first to focus specifically on ways through which digital technologies can themselves serve to include rather than exclude girls and women in education; second, to ensure that digital skills are taught throughout the education system in a gender sensitive way; and then to address the wider issues surrounding the involvement of women in the tech sector. All are important, and require fundamental changes in men's attitudes and behaviours. They also, though, need a systemic approach that builds upon all of the basic recommendations elsewhere in this report and its other Guidance Notes, not least with respect to connectivity, safety, informed access, and affordability of devices.

Digital technologies have very significant potential to include girls in education, even in contexts where they are frequently excluded. For example, even in isolated areas where women and girls are prevented from travelling to educational establishments, radio/TV education programmes can be provided to help girls (and their mothers) learn appropriate knowledge and skills. Where Internet access is available, many greater online learning opportunities are possible, not only for girls but also for older women who may never have had opportunities to learn at school. To maximise the potential for girls to learn through digital technologies it is essential to understanding their specific learning needs, and design learning approaches and content that are appropriate.

[1] Lead authors Alicja Pawluczuk, Juliette Unwin, Paul Spiesberger, and Tim Unwin.
[2] See, for example: EQUALS, https://www.equals.org/; Girls Who Code, https://girlswhocode.com/; AnitaB.org, https://anitab.org/; Laboratoria, https://www.laboratoria.la; eSkills4Girls, https://www.eskills4girls.org; and pro mujer, https://promujer.org/.
[3] Webb, D., Barringer, K., Torrance, R. and Mitchell, J. (2020) Rapid evidence review: girls' education and EdTech, EdTech Hub, https://edtechhub.org/wp-content/uploads/2020/07/RER-girls-education-3.pdf.
[4] See, for example, ITU (2019) ITU report on global gender digital connectivity finds gender digital gap is growing, http://digitalinclusionnewslog.itu.int/2019/11/05/itu-report-on-global-digital-connectivity-finds-gender-digital-gap-is-growing/.

Numerous examples are now available of ways through which governments can both encourage systemic change and also provide specific interventions that will enable women who wish so to study Science, Technology, Engineering and Mathematics (STEM) subjects at all levels in the education system and to gain careers in digital technology.[5] There are many reasons why this is desirable, not least because of the skills and expertise that they can bring to these male dominated disciplines and industries.[6] Governments should also lead by example, employing women at all levels in their administrations, particularly in the fields of science and technology.

Guidance

The guidance below focuses on the most important first steps that governments can take specifically to reduce gender digital inequalities in learning through digital technologies, and also to encourage the wider engagement of women in the science and technology sectors:

1. Governments should **ensure that girls have as equal access to digital technologies (both devices and content) as do boys throughout the education system.**
2. Governments should ensure that there is **appropriate legislation, enforcement and guidance to help protect girls and women from all forms of abuse, bullying and harassment through digital technologies**. Clear guidance should also be provided in locally relevant languages and images for girls about the safe use of digital technologies.
3. Governments should **focus explicitly on culturally specifically ways through which they can empower girls to become informed and proactive agents of future social and technological change**.
4. Governments should ensure that they **collect gender disaggregated data with respect to digital technologies**, so that they can accurately monitor changes in gender digital inequality.
5. **Governments should ensure that they put in place effective initiatives to change men's attitudes towards women and digital technologies**; emphasis should not be placed simply on providing programmes to support girls and women in technology.
6. Governments should encourage **education to be seen as a collective and networked experience**, in which learners, parents, guardians, educators and facilitators all have important roles to play, and all of whom require appropriate digital access and skills training (see also Guidance Note on partnerships).
7. **Be careful and selective in choosing the most relevant and appropriate digital "solutions" for girls**. There are very many organisations offering digital "solutions" for girls' education, and great care is needed in selecting those that are most relevant and appropriate for girls and women in your own context.

[5] See, for example, Mashable (206) These STEM initiative are inspiring women and girls around the globe, https://mashable.com/2016/01/22/women-in-stem-global/?europe=true; McCullum, K. (2014) 15 innovative initiatives bringing women into STEM, https://www.worldwidelearn.com/education-articles/15-innovative-initiatives-bringing-women-into-stem.html.

[6] Wisnioski, M. *et al.* (2019) Confronting the absence of women in technology innovation, in *Does America Need More Innovators?*, MITP, 2019, pp.323-343, https://ieeexplore.ieee.org/document/8675811.

8. **Examples of successful women should be used appropriately in all educational content**. Women scientists, for example, should be shown as often as men scientists in textbooks and online content.

Examples.

The following provide good examples of specific things that can be done to include girls in learning more broadly as well as acquiring relevant digital skills:

- BMZ (2019) *Women in Tech: inspiration, no fairy tales*, Berlin: Federal Ministry for Economic Cooperation and Development (BMZ).
- Education Development Trust (2020) Wasichana Wote Wafaulu: GEC Kenya, https://www.educationdevelopmenttrust.com/our-research-and-insights/case-studies/wasichana-wetu-wafaulu-gec-kenya.
- eSkills4Girls, https://www.eskills4girls.org/tech-needs-girls-programme-for-sustainable-economic-development/.
- Girls' Education Challenge: project profiles, https://reliefweb.int/sites/reliefweb.int/files/resources/GEC-Project-Profile-booklet-March2015.pdf.
- TEQtogether, https://teqtogether.org, guidance notes to change men's attitudes and behaviours.

Suggested further reading

- Al-Ghaib, O. A., Andrae, K., and Gondwe, R. (2017) Still left behind: Pathways to inclusive education for girls with disabilities. *Leonard Cheshire Disability*. http://www.ungei.org/Still_Left_Behind_Full_Report.PDF.
- Global Partnership for Education (2017) Guidance for Developing Gender-Responsive Education Sector Plans https://www.globalpartnership.org/sites/default/files/2018-02-gpe-guidance-gender-responsive-esp.pdf.
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- Sey, A. and Hafkin, N. (eds) (2019) *Taking Stock: Data and Evidence on Gender Equality in Digital Access, Skills, and Leadership*, Macau and Geneva: UNU and ITU, for EQUALS.
- Sperling, G. and Winthrop, R. (2015) What works in girls' education: evidence for the world's best investment, Washington: Brookings Institution. https://www.brookings.edu/wp-content/uploads/2016/07/What-Works-in-Girls-Educationlowres.pdf.
- Thakkar, D., Sambasivan, N., Yardi, P., Sudarshan, P and Toyama, K. (2018) The unexpected entry and exodus of women in computing and HCI in India, *CHI 2018: Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems*, Paper No.:352, 1-12. https://doi.org/10.1145/3173574.3173926.

- UNESCO (2017) *Cracking the code: girls' and weomn's education in science, technology, engineering and mathematics (STEM)*, Paris: UNESCO, https://unesdoc.unesco.org/ark:/48223/pf0000253479.
- Webb, D., Barringer, K., Torrance, R., and Mitchell, J. (2020) Rapid Evidence Review: Girls' Education and EdTech, https://edtechhub.org/wp-content/uploads/2020/07/RER-girls-education-1.pdf.

Guidance note: Inclusion and accessible learning for people with disabilities [1]

Context

People with greater disabilities have much more to gain from using appropriate technologies to transform their lives than do those who have fewer disabilities. Using text-to-speech technologies, blind people can hear what is written; deaf people can likewise understand what someone is saying by reading their words on a device through speech-to-text technologies. However, all too often, people with disabilities have to pay extra for having access to such "assistive technologies". Likewise, in countries with limited financial resources, it is still often argued that those resources should mainly be spent on supporting the education of those who are seen as being most able to contribute to national development, and these rarely include those with disabilities. UN agencies such as the WHO and the World Bank suggest that around 15% of the world's population live with some form of disability, of whom between 2 and 4% experience significant difficulties in functioning.[2] That means that more than a billion people have some kind of disability; digital technologies are a powerful tool to help them learn more and better, and thereby to transform their lives. Governments can make this happen.

It is very important for governments to understand the distinction between *assistive technologies* and truly *universally inclusive* technologies, and work together with people with disabilities to ensure that as much digital technology as possible is universally accessible. In the past, much emphasis has been placed on the value of assistive technologies, which can help people with a specific disability to overcome it. Text-to-speech technology, is one such assistive technology. Usually, assistive technologies are made commercially, and because of small market size they are expensive and have tended to be beyond the financial means of many people with disabilities, especially in the world's economically poorest countries. However, if all digital technologies were designed to be universally inclusive and accessible, then those with disabilities would not be further disadvantaged by having to pay additional costs for assistive technology.

There has been much progress in this area in recent years, with computer operating systems now having universal access features, and many more websites being designed in accordance with the W3C web accessibility guidelines, but there is still a long way to go. There will also always be the need for specialist assistive technologies to help with specific disabilities, although the use of Open Source Software can help reduce these costs. Optikey, for example, is an Open Source and forever free to end user solution which was created especially for people with motor and speech limitations to challenge the existing very expensive alternative and augmentative communication products on the market.

[1] Lead authors Akber Gardezi and Tim Unwin.

[2] WHO (2011) World Report on Disability, Geneva: WHO and World Bank, https://apps.who.int/iris/bitstream/handle/10665/70670/WHO_NMH_VIP_11.01_eng.pdf;jsessionid=551B5757B82CA74E0040FF7BA062934F?sequence=1; World Bank (2020) Disability inclusion, https://www.worldbank.org/en/topic/disability; The Education Commission (2016) *The Learning Generation: Investing in Education for a Changing World*, https://report.educationcommission.org/.

A further fundamental point that governments need to grasp is that there is also a powerful economic argument for investing in digital learning by people with disabilities. By ensuring that they have appropriate digital technologies for learning and can also use them in employment, governments can help to empower people with disabilities by enabling them to earn their own livelihoods, rather than having to rely on charity or state benefits. Instead of being seen as a drain on the economy, people with special abilities can become taxpayers, contributing thereby to the wider well-being of the societies of which they are a part, as well as to their own more fulfilled lives.

In essence, governments need to ensure that four things are in place to deliver the effective use of inclusive and assistive digital technologies in education:

- The technologies need to be appropriate to the needs of the learners with disabilities;
- Teachers and students need to be trained in the appropriate use of digital technologies by people with disabilities;
- These technologies need to be affordable, especially where the only available solution is an assistive technology; and
- Local language content needs to be available in accessible formats.

Guidance

The following are the most important practical action points for governments to take in ensuring appropriate and effective learning by people with disabilities through the use of digital technologies:

1. Appropriate and effective **policies and strategies should be in place to enable people with disabilities to learn and work using digital technologies**, and where these already exist they need to be implemented enthusiastically.
2. **A charismatic and effective digital inclusion champion should be appointed**, to lead on all aspects of digital inclusion in the country, and especially within the education system.
3. Governments should use their **procurement processes to insist on inclusive design** when procuring ICT technologies, especially within the education system. They should encourage the private sector to do likewise.
4. **Import duties and general sales taxes on assistive technologies should be waived** in order to encourage the development of local private sector distributorships of these technologies.
5. **Effective training programmes on digital inclusion should be introduced throughout the education system,** and should especially be implemented in vocational qualifications programmes.[3]
6. **All school districts should support learners with special needs by establishing digital accessibility centres,** which can also be used as community resource and learning centres for people with disabilities.

[3] See, for example, the Assistive Technology Foundation Course established in Qatar by the College of Education and Mada, http://www.qu.edu.qa/education/centers/nced/programs/mada.

Examples.

Examples of relevant initiatives to support digital inclusion and appropriate use of assistive technologies for learning include:

- Apple, Accessibility, https://www.apple.com/accessibility/.
- Mada – Digital Access for All, https://mada.org.qa/.
- Microsoft, Microsoft is committed to accessibility, https://www.microsoft.com/en-us/accessibility.
- New South Wales Government - Disability, learning and support, https://education.nsw.gov.au/teaching-and-learning/disability-learning-and-support/resources/assistive-technology. 12
- Optikey, https://github.com/OptiKey/OptiKey/wiki.
- UK Government (2018) Government announces Tech Fud to support disabled people and their employers, https://www.gov.uk/government/news/government-https://www.microsoft.com/en-us/accessibility-tech-fund-to-support-disabled-people-and-their-employers.
- UNESCO (2014) *Model Policy for Inclusive IOCTs in Education for Persons with Disabilities*, Paris: UNESCO, https://unesdoc.unesco.org/ark:/48223/pf0000227229.
- W3C web design and applications: accessibility, https://www.w3.org/WAI/redesign/2011/w3-sketch1.html.

Suggested further reading

- Eid, N. (2016) *Disability and Bridging the Digital Divide: ICT Accessibility and Assistive Technology for People of All Abilities*, http://www.ruhglobal.com/wp-content/uploads/2017/01/Nabil-Eid-from-Syria-Middle-East-ICT-accessibility-for-persons-with-disabilities.pdf.
- International Commission on Financing Global Education Opportunity (2016) *The Learning Generation: Investing in Education for a Changing World*, file:///Users/timunwin/Downloads/Learning_Generation_full_report_v2.pdf.
- ITU (2014) *Model ICT Accessibility Policy Report*, Geneva: ITU with the G3ICT (lead author Mandla Msimang), https://www.itu.int/en/ITU-D/Digital-Inclusion/Persons-with-Disabilities/Documents/ICT%20Accessibility%20Policy%20Report.pdf.
- Mizunoya, S., Mitra, S. and Yamasaki, I. (2016) Towards inclusive education: the impact of disability on school attendance in developing countries, *Innocenti Working Paper No. 2016-03*, https://papers.ssrn.com/sol3/Delivery.cfm/SSRN_ID2782430_code552378.pdf?abstractid=2782430&mirid=1.
- UNESCAP (2017) *Building Disability-Inclusive Societies in Asia and the Pacific: Assessing Progress of the Incheon Strategy*, Bangkok: UNESCAP, https://www.unescap.org/sites/default/files/publications/SDD%20BDIS%20report%20A4%20v14-5-E.pdf.
- UNESCO (2016) *Digital Empowerment: Access to Information and Knowledge Using ICTs for Persons with Disabilities*, Paris: UNESCO, https://unesdoc.unesco.org/ark:/48223/pf0000244543.

Guidance note: Supporting the effective use of digital technologies for learning by refugees and displaced persons [1]

Context

The increased acceptance of inclusion in national education systems provides an important opportunity for integrated approaches to education that include refugees and displaced persons to be implemented. As a principle underlying the 2018 Global Compact on Refugees,[2] new commitments by states should enable refugees to be included within national systems alongside their peers. This allows national initiatives around digital education to be extended to refugees, while also providing governments an opportunity to leverage interest from diverse actors to invest in low-resource communities that are hosting refugees.[3] In addition, these tools can be used creatively to assist refugees to adapt to their new learning environments.

Displaced populations, whether residing in remote camps, settlements, or urban contexts, tend to have more limited access to connectivity, devices and other vital infrastructure. UNHCR has thus estimated that refugees are half as likely as the general population to have an internet-enabled phone, and 29 per cent of refugees have no phone at all.[4] Even if good quality online materials are available at the national level, there remains a real issue around the access that refugees have to them, and thus a significant equity challenge. This reinforces the importance of investing in offline and low-resources solutions, along with multimodal approaches, including radio and TV, to ensure that learning resources can reach all learners.

COVID-19 has reinforced the importance of ensuring that online or remote learning is complemented with guidance and mentorship from teachers, family members, or peers. In many displacement contexts, the need for continuous follow-up and support for education is vital as often caregivers who are expected to support learning have limited exposure to digital learning, or might have low education levels themselves. Therefore, refugee students can be further disadvantaged if they do not receive the additional support required to facilitate meaningful learning.

A more general point that is also pertinent in the context of refugees is that COVID-responses have demonstrated that it is extremely difficult for governments in crisis contexts to be critical consumers of technologies and products offered by international agencies or private sector companies. In the quick scale-up of solutions several technologies may be untested or inappropriate to local contexts, and it may well lock governments or communities into such solutions long after a particular crisis is over. It is therefore important for quality assurance mechanisms or metrics to be shared widely among and between governments, to ensure not only that they do acquire technologies that are appropriate for refugees, but also that they can afford

[1] Lead authors Caroline Pontefract (UNRWA), Jacqueline Strecker (UNHCR), and Tim Unwin.
[2] UNHCR (2018) The Global Compact on Refugees, https://www.unhcr.org/uk/the-global-compact-on-refugees.html.
[3] Amnesty International thus estimates that in 2020 86% of all refugees are hosted in developing countries.
[4] UNHCR (2016) *Connecting Refugees: How Internet and Mobile Connectivity Can Improve Refugee Well-Being and Transform Humanitarian Action*, Geneva: UNHCR.

the long-term funding implications. Governments should be supported so that they are able to be critical consumers, and can use their assessed needs to engage on an equal level with other partners, particularly with the private sector.

Guidance
Relevant guidance for governments in supporting the inclusion of displaced learners in national education systems through digital technologies includes:

1. **Governments should ensure that displaced persons are prioritised within their policies to include all learners in their national digital education strategies.**
2. **Governments should accurately assess the levels of infrastructural provision in refugee hosting communities, and then support the design of relevant and diverse approaches to the use of digital technologies in serving their needs.** Low-resource technologies, such as radio, can play an important role in some contexts.
3. **Safety and security of all learners, including refugees, should be prioritized** when designing and implementing digital technologies for education initiatives (see also Guidance Note on safety).
4. **A coherent and feasible approach to remote learning should be created to support refugees both academically and psycho-socially**. This should be in place prior to any potential displacements, so as to help build resilience into education systems.
5. **Governments should work on an equal basis with partners to provide zero-rated education platforms** that enable refugees to download educational content at no cost for refugees (see also Guidance Notes on OER and contextualised content).
6. **Systems should be in place to ensure that refugees can obtain relevant qualifications, degrees, certificates and badges on completion of online training and courses.**
7. **All those involved in helping refugee children learn should be provided with appropriate training in the effective and safe use of digital technologies for learning**, including parents, community workers, teachers, and relevant civil society staff.

Examples.
Good examples of digital technology use by refugees include:

- Queen Rania Foundation (2020) Educational response to COVID-19 from Jordan and other Arab countries, https://www.qrf.org/en/latest/blog/educational-response-covid-19-jordan-and-other-arab-countries
- UNRWA's EMIS enabling students to register for school and obtain online certificates of completion, https://emis.unrwa.org/Result/Index.
- Jordan: Noorspace (https://noorspacejo.azurewebsites.net) and Darsak (https://darsak.gov.jo/) – the latter, with no log-in required was much more popular than the former during the COVID-19 pandemic.

Suggested further reading

- McBurnie, C., Taskeen, A., Kaye, T. and Haßler, B. (2020) Zero-rating educational content in low- and middle-income countries, Cambridge: EdTech Hub Helpdesk Response No. 8, https://docs.edtechhub.org/lib/F4PCMTZB.

- Culbertson, S., Dimarogonas, J., Costello, K. and Lanna, S. (2019) *Crossing the Digital Divide: Applying Technology to the Global Refugee Crisis*, Santa Monica, CA: Rand Corporation, https://www.rand.org/content/dam/rand/pubs/research_reports/RR4300/RR4322/RAND_RR4322.pdf
- GSMA (2019) *The Digital Lives of Refugees: How Displaced Populations Use Mobile Phones and What Gets in the Way*, London: GSMA, https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2019/07/The-Digital-Lives-of-Refugees.pdf.
- UNHCR (2016) *Connecting Refugees: How Internet and Mobile Connectivity Can Improve Refugee Well-Being and Transform Humanitarian Action*, Geneva: UNHCR, https://www.unhcr.org/5770d43c4.pdf.

Developed in collaboration with UNHCR (The UN Refugee Agency), and with UNRWA (The UN Relief and Works Agency for Palestinian Refugees in the Near East)

Guidance Note: Digital technologies and education in Small Island Developing States (SIDS) [1]

Context

Small Island Developing States (SIDS) have increasingly been recognised globally as having very distinct challenges, both socially and economically. COVID-19 has especially highlighted their vulnerability to extreme events and isolation. Whilst they have readily been able to impose strict quarantine measures, their economic systems have been severely impacted, both through loss of exports and a collapse in tourism. They are also becoming increasingly vulnerable to extreme weather events, and so the provision of resilient infrastructure (digital connectivity, electricity, and school buildings) must be a very high priority. Moreover, especially in the Pacific, the extensively dispersed character of many island groups makes the creation of any systematic and holistic intervention much more problematic than in continental countries. Furthermore, the small size of most of their populations, means that there are often significant human capacity challenges in government administrations.

Despite these challenges, digital technologies when used appropriately can bring very significant benefits to education systems in SIDS, especially for the most marginalised and isolated. If resilient electricity (see separate Guidance Note on electricity) and connectivity are made available, the potential of digital technologies to provide learning resources in local languages alongside international content any-time and any-where can be leveraged to ensure that everyone can receive a basic education during crisis situations of all kinds (see Guidance Note on content and local context). It is also essential to take note of expected sea-level changes in identifying the optimal locations for service provision and the technologies that should be used. It is also important that challenges of rain fade and other forms of signal disturbance are overcome through the appropriate choice of spectrum. Spectrum management is thus particularly important, and each jurisdiction should establish spectrum policies with a clear roadmap on which frequencies will be acquired and used in both the short-term as well as the longer-term. It may well, for example, be that the lower frequency C-band deployments which are generally immune to poor weather conditions will remain preferable to the higher frequency Ku-band and Ka-band deployments that are becoming more popular elsewhere in the world.

Given the low populations of many SIDS, there is much to be said for encouraging regional initiatives that can negotiate competitive tenders with mobile operators and other technology providers, and also share collective experiences between the governments of other SIDS. Such initiatives, though, must not be at the expense of challenging national identities and cultures; getting the balance right between the international, regional and the national is not always easy. Nevertheless, governments of SIDS do need to work together over such issues as regional Internet Exchange Points (IXPs), and also the implementation of effective multi-sector partnerships (see separate Guidance Note) that can help ensure appropriate technical understanding within their government departments and education systems.

[1] Lead authors Emma Kruse Vaai, Cris Seecheran, Mohamed Shareef, Javier Rua, and Tim Unwin.

The introduction of digital technologies within the education systems of SIDS must also show respect for their cultural traditions and values, as with the Samoan concept of Measina, which is difficult to translate directly, but captures the essence of the sacred, why we are who we are, and our cultural values and traditions. Although sciences, technology and mathematics are valuable in their own right, they also need to be used to support these important cultural and traditional elements as well as traditional arts, rather than simply supplanting them with a new technologically-determined and individualistic materialism. Digital technologies can be very valuable in helping island states to prepare well and craft sustainable solutions to overcome future pandemics and crises, but island people themselves must be an integral part of the preparation, crafting and implementation of such initiatives.

Guidance

Relevant guidance for governments of Small Island Developing States (SIDS), which should be read in conjunction with the themes mentioned in the main Report, as well as other Guidance Notes includes:

1. It is especially important for governments of SIDS to establish **comprehensive medium-term planning and implementation practices to ensure that resilient infrastructures** (electricity, connectivity, and places for education) are constructed to withstand extreme weather events and sea-level change.
2. **Digital learning systems should not focus exclusively on technical education, but should also respect the traditionally diverse cultures and languages of island peoples**. Digital technology must be sensitive to cultural significance and meaning.
3. **Regulators in SIDS need to take particular care to establish systems that are technologically agnostic** so that different technological solutions can be used to provide optimal solutions in their diverse contexts.
4. **It is especially important for learning content to be made available in local languages and in ways that are appropriate to the diversity of island cultures**.
5. **SIDS governments should participate actively in regional initiatives to share good practices with respect to the appropriate use of digital technologies for learning**. Bilateral and multilateral donors should also help strengthen such institutions

Examples.

Examples of the use of digital technologies for education in SIDS:

- Asian Development Banks (2018) *ICT for Better Education in the Pacific*, Metro-Manila: Asian Development Bank, https://think-asia.org/bitstream/handle/11540/8529/ict-education-pacific.pdf?sequence=1.
- Commonwealth of Learning, Virtual University for Small States of the Commonwealth, https://vussc.col.org.
- UNESCO Bangkok, ICT in Education, https://bangkok.unesco.org/theme/ict-education.

Links to regional initiatives among SIDS.

- Asia Pacific Network Information Centre (APNIC) https://www.apnic.net/

- Asia-Pacific Satellite Communications Council (APSCC) https://apscc.or.kr/about/
- Caribbean Telecommunications Union (CTU) https://www.ctu.int/
- Eastern Caribbean Telecommunications Regulatory Authority (ECTEL) https://www.ectel.int
- Pacific Islands Telecommunications Association (PITA) http://www.pita.org.fj
- Pacific Telecommunications Council (PTC) https://www.ptc.org/

Suggested further reading

- Hogeveen, B. (2020) *ICT for Development in the Pacific Islands*, Barton: ASPI International Cyber Policy Centre, https://s3-ap-southeast-2.amazonaws.com/ad-aspi/2020-02/ICT%20for%20development%20in%20the%20Pacific%20islands.pdf?x_oS.r8OVVfTlxxgNHI58k_VL45KC83H.
- ITU (2008) Handbook: Radiowave Propgation Information for designing Terrestrial Point-to Point Links, Geneva: ITU, https://www.itu.int/dms_pub/itu-r/opb/hdb/R-HDB-54-2009-OAS-PDF-E.pdf.
- Peters-Richardson, J. (2016) ICTs and OERs Antigua and Barbuda's journey, http://oasis.col.org/bitstream/handle/11599/2509/PDF?sequence=4&isAllowed=y.
- UN General Assembly, High-Level Dialogue on Samoa Pathway (2019), *World Leaders Endorse Political Declaration to Help Small Island Developing States Cope with Climate Change, during General Assembly Review of Samoa Pathway, GA/1219727 SEPTEMBER 2019,* http, s://www.un.org/press/en/2019/ga12197.doc.htm
- UN Sustainable Development Goals Knowledge Platform, https://sustainabledevelopment.un.org/topics/sids.
- UNESCO SIDS Platform, Capacity Development and Education for Sustainable Development, http://www.unesco.org/new/en/natural-sciences/priority-areas/sids/sids-conferences/mauritius-conference-2005/themes/education-capacity-building/.

Guidance note: Ensuring resilient connectivity [1]

Context

Reliable and affordable connectivity is essential for users to benefit from distance learning. Due to the potential issues such as availability, affordability, and quality in marginalised environments, providing full connectivity for each school may not be feasible. In these circumstances, governments should explore alternative connectivity options and distance education delivery methods to ensure that the education system as a whole remains resilient. Where Internet connectivity is available, it is also important to ensure that this is meaningful and allows teachers and students to pursue their educational activities without interruption.

Governments should address availability, affordability, and quality to promote connectivity for those living in marginalised environments.

- **Availability** - During crises and pandemics, students, teachers, and administrators depend heavily on access to the infrastructure needed to make distance learning possible.
- **Affordability** - Unless the available connectivity is affordable, the most marginalised will not be able to use the services. Therefore, addressing affordability must be prioritised in ways that still permit sustainable availability. Many initiatives opt to provide services to the most marginalised for free or extremely low charges which impacts the long-term sustainability of the initiatives.[2]
- **Quality** - Connectivity must be consistently available with sufficient bandwidth and limited disruption, which means providing connectivity through a resilient infrastructure with capacity sufficient to meet any pandemic-related increases in demand.

Governments can usefully take the following actions to address these issues:

- Governments should work together with mobile network operators and internet service providers to collaborate in offering affordable connectivity solutions for marginalised communities.
- Governments should expedite the allocation of additional spectrum to ensure stability and to meet increases in demand.
- Mobile network operators could provide the most marginalised with zero-rated access to essential services, such as educational materials.
- Educational institutions, such as Colleges and Universities, can contribute with data.[3]

Governments should develop an action plan for distance learning with respect to the level of connectivity in any given area. There are often three different levels of connectivity and accompanying delivery methods:

- **No Internet connectivity** - Broadcasting classes through television and radio, printing and distributing class material

[1] Lead authors Müge Haseki, Leon T. Gwaka, and Christopher S. Yoo.
[2] Even though services must be affordable among the poor, connectivity initiatives need business models which enable them to be sustainable.
[3] For instance, in South Africa, universities provide students with 30GB to facilitate distance learning.

- **Limited/unreliable Internet connectivity** - Asynchronous classes using mobile phones or devices and possibly distributed storage
- **Full Internet connectivity** - Broadcasting videos through websites/portals/ social media

Many of the most marginalised communities are typically located in areas with limited to no Internet infrastructure. Governments can support alternative connectivity initiatives in these areas based on the availability of resources. These include:

- **Digital Squares** - Digital Village Squares in India, for example, offers 28 standalone HiWEL stations and 23 stations for digital literacy training using the National Digital Literacy Mission's curriculum in a low resource environment.
- **Cyber Caravans** - Mobile classrooms (known as Cyber Caravans) can be equipped with computers and broadband Internet connection. The National Computer Board in Mauritius offers Cyber Caravans for communities in remote areas, allowing them to access the Internet and participate in training programs with the devices and connectivity on board.
- **Portable Wi-Fi devices** - Another option is providing connectivity through portable Wi-Fi devices. Educators in areas with no connectivity in South Africa, for instance, were provided with Wi-Fi dongles that allowed them to conduct teaching and student support remotely
- **Community networks** - When a commercial service is not feasible and a government's resources are limited, local communities can be encouraged to build their own networks. The Zenzeleni community network in South Africa, for instance, have provided a solar-powered WiFi network to the homes of over 3000 people and 3 schools in an underserved community since 2012.
- **Public Wi-Fi hotspots** - Mawingu Networks create public Wi-Fi hotspots in hundreds of communities where low-income populations in Kenya can log in to pay-as-you-go accounts.

Governments should also consider the most appropriate available cost-effective technologies to provide Internet connection. These include the following:

- **Mobile connectivity** - This refers to connectivity through mobile network SIM cards.
- **TV White Space (TVWS)** - TV White Space refers to a set of frequencies in the wireless spectrum previously used by terrestrial television. The gaps created by the switch to digital broadcasting freed up part of the spectrum. Numerous efforts are underway exploring whether TVWS can be used to support broadband internet service.
- **Satellite (VSAT)** - Multiple providers are attempting to offer connectivity via two-way signals transmitted and received through an earth station satellite dish.
- **Off-the-shelf technologies** - These refer to plug and play connectivity solutions, such as Wireless Rural Extensions (WiRE) which is a low-power rural wireless network architecture that provides cellular connectivity using OpenBTS-based GSM microcells.[4]

[4] Dhananjay, A., Tierney, M., Li, J., & Subramanian, L. (2011). WiRE: a new rural connectivity paradigm. *ACM SIGCOMM Computer Communication Review*, *41*(4), 462-463.

In addition, most marginalised communities lack supporting infrastructure, such as electricity[5] (see Guidance Note on electricity) and anchor tenants that can provide shelter and security for digital technologies to increase their durability.

Guidance

To achieve connectivity for education, we suggest that it is useful for governments to consider the following principles:

1. **Conduct comprehensive assessment of connectivity levels** to understand where connectivity gaps are and ensure data-driven planning.
2. **Develop complementary infrastructure, including reliable electricity,** before digital technologies are introduced in schools.
3. **Be technology agnostic** and consider the existing connectivity options before developing or integrating new technologies.
4. **Identify the local infrastructure problems** to select the most appropriate connectivity initiative to fund and support.
5. **Build a sustainable and scalable connectivity plan** from the beginning.
6. **Identify the challenges of the most marginalised learners** to access connectivity and come up with an action plan to address them.
7. **Leverage resources from other local and global initiatives** to develop and improve connectivity.
8. **Identify key stakeholders and their roles** in building resilient and affordable connectivity systems.

Examples

Examples of interesting connectivity models for education from which important lessons, both positive and negative, can be learnt are profiled by the University of Pennsylvania's 1 World Connected project[6]:

- Zaya Learning Lab. Available at: http://1worldconnected.org/wp-content/uploads/2017/12/052517_Zaya-Learning-Lab_FB-.pdf.
- Maendeleo Foundation. Available at: http://1worldconnected.org/case-study/maendeleo-foundation/.
- Digital Village Squares. Available at: http://1worldconnected.org/case-study/digital-village-squares/

Suggested further reading

- Andrew, T. N. and Petkov, D. (2003) The need for a systems thinking approach to the planning of rural telecommunications infrastructure, *Telecommunications Policy*, *27*(1-2), 75-93.
- Graydon, M. and Parks, L. (2019) 'Connecting the unconnected': a critical assessment of US satellite Internet services, *Media, Culture & Society*, 0163443719861835.
- Gwaka, L. T., May, J. and Tucker, W. (2018) Towards low-cost community networks in rural communities: The impact of context using the case study of Beitbridge, Zimbabwe, *The Electronic Journal of Information Systems in Developing Countries*, 84(3), e12029.

[5] A detailed discussion on electricity is provided in a separate Guidance Note and discussed in Section 10 of the report.

[6] http://1worldconnected.org/

- Heimerl, K., Hasan, S., Ali, K., Brewer, E. and Parikh, T. (2013, December) Local, sustainable, small-scale cellular networks. In *Proceedings of the Sixth International Conference on Information and Communication Technologies and Development: Full Papers*-Volume : 2-12.
- See Kuriyan, R., Nafus, D. and Mainwaring, S. (2012) Consumption, technology, and development: the "poor" as "consumer". *Information Technologies & International Development*, *8*(1): 1-12.
- Rich, M. J. and Pather, S. (2020) A response to the persistent digital divide: Critical components of a community network ecosystem, *Information Development*, 0266666920924696.
- UNHCR (no date) Community-led Connectivity Assessing the potential of Community Network Models in the context of forced displacement in East Africa. Available at: https://www.unhcr.org/innovation/wp-content/uploads/2020/05/Community-led-Connectivity-WEB052020.pdf.

Developed in collaboration with the University of Pennsylvania

Guidance note: Resilient and sustainable energy solutions[1]

Context

All digital technologies require reliable and stable electricity for them to be used effectively. However, far too often initiatives designed to use ICTs to support marginalised people and communities over the last 20 years have failed to pay this crucial issue the attention that it deserves. As Table 1 (Part I) reminds us, less than 70% of primary schools across the world had access to electricity in 2018. Any initiatives designed to use digital technologies in these schools will therefore be impossible unless electricity in some form is provided to them; electricity provision and Internet connectivity must go hand in hand. Moreover, many of the most marginalised, those who do not go to school or live in isolated areas, simply do not have access to any form of electricity, but can nevertheless benefit hugely from its provision in ways that go far beyond merely formal education. Electric light can not only extend the time people have to learn, but it also enables them to work longer hours, to enjoy entertainment together, and even improve their health.

Where grid electricity solutions are not available, alternative smaller scale, or even micro-solutions can play a very important part in enabling digital technologies to be used effectively. Solar and wind-turbine solutions are the most frequently promoted, but alternatives such as micro-hydro, or even simple bicycle dynamos or handheld charging devices, especially when combined with low-cost radios and tiny solar panels, can make a huge difference to people's abilities to learn through digital technology. For many of the most marginalised and isolated, Interactive Radio Instruction (IRI) remains a vitally important means through which they can learn.

Much of the digital technology sector, though, is based on business models that are fundamentally unsustainable. Mobile devices often only last for a couple of years before needing to be replaced, new software sometimes requires a hardware upgrade (and vice versa), the Internet creates about as much CO^2 emissions as does the airline sector, some companies make it extremely difficult for people to repair their devices, and the use of scarce minerals means that considerable environmental damage is caused by the mining associated with their extraction.[2]

These challenges are particularly pressing for Small Island Developing States (SIDS), especially as they face challenges from rising sea levels, and the apparently increasing frequency of violent storms which have a significant impact on infrastructure, notably digital connectivity and electrical power (see also Guidance Note on SIDS). It is especially pertinent for them to strive for maximum possible energy self-sufficiency and resilience given inherent logistical complexities associated with island clusters, which are aggravated during and after extreme weather events, and the high financial and environmental costs of fossil fuels.

[1] Lead authors Javier Rua and Tim Unwin.
[2] For a wide-ranging review, see Unwin, T. (2020) Digital technologies and climate change, https://unwin.wordpress.com/2020/01/16/digital-technologies-and-climate-change/.

As with so many connectivity and infrastructure challenges relating to provision for the most isolated and marginalised, there is also a fundamental equity issue that needs to be addressed: providing electricity to low density isolated, and especially mountainous areas is generally much more expensive than it is to deliver it to people living in high-density, low-lying cities. It is therefore not just a question of having the technology to supply the energy, but it must also be delivered affordably and reliably. Although solar power and a new telecentre have, for example, been provided in the Kelabit Highlands of Sarawak, there remain real challenges in ensuring that electricity and connectivity are not disrupted during heavy rainstorms, and solar panels must always be tightly secured to rooves. Likewise challenges with supply chains to remote schools mean that replacing expensive lithium batteries can take several months, during which time connectivity for learning through digital devices will be disrupted.

Guidance
Relevant guidance for governments on delivering affordable, reliable and sustainable electricity to power digital technologies includes:

1. **Reliable electricity must first be provided to any educational establishment** before digital technologies are introduced.
2. **Governments must be prepared to help finance electricity provision in isolated and marginalised areas**; this may well require charging urban consumers more for their electricity.
3. **Context appropriate sustainable technologies** (such as micro-hydro or solar) **should be used for off-grid electricity provision for learning in isolated areas**
4. **Consideration should be given to construction of appropriately secured rooftop photovoltaic cells on school buildings**, and supporting this with the latest battery technologies.
5. **Holistic and integrated approaches must be adopted to provide context specific education, electricity and digital technology** for the most marginalised**.** This will often imply using old but available technologies in appropriate new ways for learning.
6. **Emphasis should also be placed on delivering appropriate and integrated electricity solutions across all public sector services in remote areas**, thus combining electricity and connectivity supply to co-located schools, health clinics and local government offices**.**

Examples.
Examples of innovative and creative provision of electricity solutions include:

- Solar energy for ICT in Bangladesh (see Uddin *et al.* 2019 below)
- Micro-hydro and solar power in Kelabit Highlands, Sarawak, Malaysia (see Kuok and Chan, 2012, and Sarawak Energy, 2016, below)
- M-KOPA Solar, http://www.m-kopa.com.
- Mission Innovation – a global coalition of 24 countries with the Europe Commission, http://mission-innovation.net/our-work/innovation-challenges/off-grid-access-to-electricity/

- Burgess, C., Locke, J. and Stone, L. (2020) *Solar Under Storm for Policymakers: Select Best Practices for Resilient Photovoltaic Systems for Small Island Developing States*, Basalt CO: Rocky Mountain Institute, Clinton Foundation and UN-OHRLLS, https://rmi.org/insight/solar-under-storm/.
- Village Infrastructure Angels, http://www.villageinfrastructure.org.

Suggested further reading

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- 2019 SDG Tracking Report, https://sustainabledevelopment.un.org/content/documents/2019_Tracking_SDG7_Report.pdf.
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- UN (no date) Caribbean Center for Renewable Energy and Energy Efficiency (CCREEE) and The Partnership for SIDS: https://sustainabledevelopment.un.org/partnership/?p=7504.
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- Unwin, T. (2017) ICTs, sustainability and development: critical elements, in Sharafat, A. and Lehr, W. (eds) *ICT-Centric Economic Growth, Innovation and Job Creation,* Geneva: ITU, 37-7.
- Zajicek, C. (2019) How solar mini-grids can bring cheap, green electricity to rural Africa, ODI blogs, https://www.odi.org/blogs/10730-how-solar-mini-grids-can-bring-cheap-green-electricity-rural-africa.

Guidance note: Involving marginalised young people in the design of their own education [1]

Context

There is good evidence that students learn better when they are actively engaged in the learning process. Involving students more in their own learning is thus an integral part of a shift in pedagogy away from traditional more didactic modes towards more constructivist theories of education and teaching practice. Like most change, this can be challenging. In many cultures such a shift is often resisted because it is seen as undermining traditional models of authority, power and knowledge sharing between generations.

The extent to which children, young people, and indeed adults doing vocational courses are involved in decisions over the curriculum and their modes of learning varies hugely between and within different countries. Ultimately, decisions about "learners' voices" require careful and challenging balances to be made. To what extent should students be active agents in organising, directing and implementing their own learning? How much are students simply viewed as teaching recipients? How well is each student understood? Do those who administer education and teach take account of the daily challenges each student might face?[2] Is the balance between the influence of central government agendas, school leaders' and teachers' influence, parents' influence and the influence of students themselves optimal?

The most important reasons why it is important to engage students in their own learning processes include:

- Learning outcomes are generally improved;
- Young people take more interest in their learning if they have invested time and effort in helping to design it;
- Involving young learners enhances their sense of responsibility; and
- Teachers and facilitators can learn much from their pupils and students, and thus improve their teaching strategies and skills.

There are many examples of good practice in the involvement of learners in the education process (see below), but almost all of these are based within schools or tertiary institutions. Most "educationalists" and government officials have little real experience of the lives of the poorest and most marginalised children and adolescents not in school, and are therefore ill-placed to design educational systems and learning opportunities best suited to their needs. This is particularly so when digital technology solutions are designed "for" rather than "with" marginalised people and communities. Hence, it is always very important to involve young people who have never been to school in designing curricula, content, and the digital systems used to interact with the learning resources intended to educate and support them. The eSkwela alternative learning system (ALS) designed in the mid-2000s in the Philippines was one example, though, where out-of-school youth were explicitly asked about their learning

[1] Lead authors Gavin Dykes, Janet Longmore and Tim Unwin.

[2] For example: which students are hungry, which students are living in insecure circumstances, which students have caring responsibility for their parents or younger siblings (or even their own children), and which students are critical economic contributors to their families and communities?

aspirations as an integral part of the design process (see Tan, 2010; and Unwin *et al.*, 2007).

Digital technologies can themselves also be used to help inform teachers and administrators about the varying ways through which different children learn most effectively, but all of these raise fundamentally challenging ethical questions.[3] China has thus been at the forefront in using the latest technologies, and especially AI, to track what children are doing while they are learning in real time, thereby enabling teachers to intervene more appropriately and precisely to help each child improve their learning outcomes.[4] However, these are passive means of learning from children, and seem unlikely to have the positive cognitive impact of actually engaging with children in their thinking about and experiences of learning.

Guidance

The following five principles are essential for governments who wish to create education systems that engage effectively with the learners for which they are intended:

1. **All aspects of digital learning, including platforms, access and content, should be designed *with* rather than *for* young people**. Particular attention should be paid to the needs and insights of the most marginalised.
2. **Governments should design specific programmes to develop learners' voices, contributions and responsibilities as a continual process** not only within schools, but also in informal learning settings.
3. Young people learn much from each other. Hence, **they should be encouraged to work in teams when using digital technologies, to encourage mutual assistance, support and responsibility.**
4. It is essential to have resilient systems in place that **encourage and support peer-to-peer learning and collaboration**, especially during times of crisis. Online learning can be a lonely process, and many young people find it difficult to complete online learning by themselves.
5. **Partnerships that involve civil society can help bridge the gap between government priorities, private sector approaches, communities and the needs and interests of young people** (see also Partnership Guidance Note).
6. **Great care should also always be involved in safeguarding young people involved in such initiatives.**

Examples

Examples of good practices in youth engagement include:

- Apps for Good (materials for students), https://www.appsforgood.org.
- Connected North, https://www.connectednorth.org/en.
- Digital Opportunity Trust (DOT), https://www.dotrust.org.

[3] See for example Terzon, E. (2017) How the rise of apps in Australian classrooms is coming with privacy and learning concerns https://www.abc.net.au/news/2017-03-13/rise-of-parent-teacher-behaviour-apps-in-australian-classrooms/8340414.

[4] See Wang, Y., Hong, S. and Tai, C. (2019) China's efforts to learn the way in AI start in its classrooms, *Wall Street Journal*, https://www.wsj.com/articles/chinas-efforts-to-lead-the-way-in-ai-start-in-its-classrooms-11571958181.

- Delhi's Happiness Curriculum (2019), http://www.edudel.nic.in/welcome_folder/happiness/HappinessCurriculumFramework_2019.pdf.
- Phillipines eSkwela initiative (see Tan, 2010 below)

Suggested further reading

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- Quaglia, R.J., Corso, M.J., Fox, K. and Dykes, G. (2016) *Aspire High: Imagining Tomorrow's School Today*, Thousand Oaks, CA: Corwin.
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- Torbjørn Moe (2009) You decide, Cisco (Norway), https://www.cisco.com/c/dam/en_us/solutions/industries/docs/education/YouDecide.pdf.
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Developed in collaboration with the Digital Opportunity Trust

Guidance Note: Prioritising effective and appropriate teacher training [1]

Context

COVID-19 has highlighted the very important roles that teachers and facilitators have in supporting learning, but also the huge dearth that many also have in terms of understanding and experience of using digital technologies effectively to support learning. All too often during the pandemic, teachers have tried to "teach" the same old way but with new technologies. In most cases this has resulted in depressing failure.

There have long been calls for teachers in Africa and Asia to be trained effectively in ways of using digital technologies, but governments have frequently chosen instead to roll out computers or laptops in schools, without sufficient attention being paid first to training teachers in their appropriate and effective use. The worst examples have even sought to replace teachers completely with digital hardware and imported video content, on the grounds that teachers are insufficiently competent to teach pupils effectively. Globally, it is estimated that around 15% of teachers in primary education are untrained, with the figure rising to about 30% in the least developed countries.[2]

Four main reasons help to explain why there has often been greater emphasis on getting digital technologies into schools rather than first training teachers effectively in their use:

- The promotion of a false belief – and wishful thinking - that digital technologies can solve all the problems of education without the need for teachers.[3]
- The school market is very much larger than the teacher training market, and companies interested in short-term gains have therefore been much more eager to sell "kit" to large numbers of schools, rather than investing in the relatively small numbers of teacher training institutions.
- The belief that young people can use digital technologies better than teachers, which is often not true but always serves significantly to demotivate the latter. This failure is not a failure of teachers, but rather one of insufficient training for them in how to use these technologies effectively to support learning.
- Many governments have also been eager to use digital technologies in schools to promote their political agendas. Giving children tablets is a very obvious material way in which governments can be seen to be providing largesse, especially in the run-up to elections.

In contrast, countries with successful education systems always have motivated, well-respected teachers, who understand that learning is more important than the technologies used to craft knowledge (see, for example, Finland). Transforming teacher education is therefore one of the most important parts of the much wider social

[1] Lead author Tim Unwin.
[2] Figures from World Bank for 2018 based on UNESCO Institute of Statistics, https://data.worldbank.org/indicator/SE.PRM.TCAQ.ZS?end=2019&start=1997.
[3] But see, for example, Mitra, S. (2020) Children and the Internet: learning, in the times to come, https://www.cevesm.com/article-children-and-the-internet-2.

and cultural transformation of pedagogy and learning summarised in Section 12 of this Report.

In practice, teachers and facilitators should be encouraged to think clearly about, and gain relevant experience, in four main areas:

- How to use digital technologies to support their own learning about both pedagogy and subject content;
- How to use them to support and facilitate learning by pupils and students;
- How to use them effectively in formative and summative assessment;
- How to share material and ideas with their peers.

Guidance

Teachers and facilitators are of central importance in all education systems. Governments should therefore prioritise appropriate pre-service and in-service teacher professional development to ensure that:

1. Teachers are **appropriately trained to use digital technologies to support all aspects of their own learning and teaching**, rather than merely to gain basic digital skills.
2. **Integrated pre-service and in-service training programmes** in the appropriate use of digital technologies are implemented for all educators and facilitators in public schools, colleges and vocational training establishments.
3. Schemes are implemented to ensure that **all teachers can afford devices and connectivity** in their homes or hostels.
4. **Appropriate and reliable infrastructure** (Internet connectivity, electricity, devices and digital content) **is provided first to teacher training institutions** and only then rolled out to schools.
5. **Digital technologies are used as a means to help transform pedagogy**, rather than as an end in themselves.
6. The use of **digital technologies for learning is integrated across the school curriculum**, and not taught merely as a subject in itself.
7. **Teachers are closely involved in the design and crafting of relevant training programmes** for them on the use of digital technologies.
8. **Safety, security and privacy** are featured prominently in all training relating to the use of digital technologies.

UNESCO's ICT Competency Framework for Teachers

Source UNESCO (2018) *UNESCO ICT Competency Framework for Teachers*, Paris: UNESCO, p.7.

Recognising that it was important for there to be clear global guidelines for teacher competency in the use of ICTs, UNESCO and its private sector partners initiated the development of a competency framework in the mid-2000s, which was first published in 2008. As the use of digital technologies in education has evolved, this has been revised twice, with Version 3 being made available in 2018. This latest version links the framework explicitly to the UN's Agenda 2030 for Sustainable Development, and includes a focus on inclusive education and Open Education Resources. It also emphasises the need for teachers "to help students become collaborative, problem-solving, creative learners and innovative and engaged members of society".[4] The framework identifies six areas of a teacher's professional practice, and three successive stages of development in making pedagogical use of ICTs as outlined below:

Examples.

Examples of interesting initiatives that have sought to train and support teachers in their appropriate use of digital technologies include:

- The Mohammed Bin Rashid Smart Learning Programme (MBRSLP) in the United Arab Emirates, see Jigsaw Consult (2014) MBRSLP Research 2013-2014, https://www.pdffiller.com/jsfiller-desk14/?projectId=489789602#c765ffcddeefbf8b40834f1e51c634bb.

[4] UNESCO (2018) *UNESCO ICT Competency Framework for Teachers*, Paris: UNESCO, p.7, https://www.open.edu/openlearncreate/pluginfile.php/306820/mod_resource/content/2/UNESCO%20ICT%20Competency%20Framework%20V3.pdf

- UNESCO ICT Competency Framework for Teachers(2018 Version 3) https://www.oercommons.org/hubs/UNESCO.
- Rwanda ICT Essential for Teachers Course https://www.oercommons.org/groups/rwanda-ict-essentials-for-teachers-course/1207/?__hub_id=32.
- Meisalo, V/, Lavonen, J., Sormunen, K., and Vesisenaho, M. (2010) *ICT in Finnish Initial Teacher Training*, Helsinki: Reports of the Ministry of Education and Culture, Finland 2010:25, https://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/75509/okm25.pdf?sequence=1.

Suggested further reading

- Fisher, T., Higgins, C. and Loveless, A. (2006) Teachers learning with digital technologies: a review of research and projects, Futurelab (Report 14), https://www.nfer.ac.uk/publications/futl67/futl67.pdf.
- iTEC: Designing the Future Classroom (no date) iTEC Knowledge Map, http://itec.eun.org/web/guest/knowledge-map.
- Kihoza, P., Zlotnikova, I., Bada, J. and Kalegele, K. (2016) Classroom ICT integration in Tanzania: Opportunities and challenges from the perspectives of TPACK and SAMR models. *International Journal of Education and Development using ICT, 12*(1), https://www.learntechlib.org/p/173436/.
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- Unwin, T. (2005) Towards a framework for the use of ICT in teacher training in Africa, *Open Learning*, 20(2): 113-129

Guidance Note: Using digital technologies effectively in support of learning and training for employment [1]

Context

Latchem (2017: 28-29) has commented that "There is little in the way of systemic application of ICTs across the [TVET] sector in ways that will achieve the fundamental transformation of education and training that is called for". This view was reinforced by more recent joint ILO and UNESCO work that found increasing evidence that while the digitization of Technical and Vocational Education and Training (TVET) is included in multiple policies and actions at all levels of government, there are few examples of governments having a unitary coherent strategy towards it; much innovation in digital TVET is driven by individual education and training institutions (ILO and UNESCO 2020). Despite various small-scale or pilot projects in which digital technologies have been used to support skills acquisition, there are few agreed good practices specifically for the sector beyond generalisations that apply across all aspects of learning through the use of such technologies.

There are three main reasons for this lack of systemic application of digital technologies within TVET:

- Traditionally most education systems across the world have been dominated by academic and intellectual interests, which privilege schools and universities over vocational and technical training;
- This has been associated with a dearth of funding for vocational training; if education as a whole is underfunded, then vocational education and training is yet further disproportionately underfunded within the education sector as a whole; and
- The application of digital technologies within vocational education and training is complex and presents specific challenges for the use of traditional digital technology. Not least, vocational training institutions, teachers and students often lack the skills necessary to use and benefit from digital technologies.

Yet, as illustrated in Section 9.4 of this Report, universities across the world are not producing the knowledge and skills required for the creation of thriving economies, be they the skills for entrepreneurship or for the very substantial requirement for well-trained labour across industry. Given that many university degrees are not worth the paper they are written on, there is a strong argument for governments to restructure funding away from universities and towards TVET, not only formally within colleges, but also through on-the-job training, and other informal means of learning. Indeed, with the greater global emphasis now being paid to lifelong and lifewide learning, this would seem to be an ideal opportunity to develop a novel systematic approach to using digital technologies, both old and new, in building the flexible skills based required by all economies in a post-COVID world, that considers the full spectrum from low-tech to high-tech.

Particular challenges that emerged during and following the lockdowns in the first half of 2020 include the following:

[1] Lead authors Paul Comyn (ILO) and Tim Unwin.

- Many existing learning solutions using digital technologies are not well adapted to vocational or technical training, and seem unlikely to offer a permanent replacement for face-to-face teaching;
- The central place of work-based learning (WBL) in many vocational and skills programs was disrupted as a result of lock downs and unemployment;
- Much vocational education and technical training involves the learning and development of practical skills which cannot yet be replicated readily using simulations and Virtual Reality (VR) or Augmented Reality (AR) tools; and
- There remain deep inequalities in access to and affordability of digital technologies which mean that those who most need such training can often least afford them.

In addition to the many recommendations contained within this report about using digital technologies more broadly within education and learning, particular attention is required to develop innovative ways of using these technologies to enhance the appropriate and effective delivery of a wide range of vocational and technical training. The poorest and most marginalised on whom this Report focuses rarely attend higher education, and often have learning preferences best suited to practical training directly linked to workplace practice. As such, they have most to gain from a reinvigorated technical training sector. This would also have positive repercussions for enhancement and formalisation of the informal sector more widely. The recommendations below are of most immediate importance, but further more detailed information can be gathered from the subsequent examples and suggestions for further reading.

Guidance

Governments should first focus on the following five main issues when addressing the development of technical and vocational education and training through the use of digital technologies:[2]

1. **The use of digital technologies for technical and vocational education and training should be prioritised nationally** since this sector provides valuable learning opportunities that are of direct benefit to the productive economy.
2. **Increased investment, both absolutely and as a share of the national education budget, should be made in digital solutions for practical skills development.**
3. **Distance-learning and short-course content should be developed for core, entrepreneurial and employability skills.**
4. **Flexible assessment and certification approaches need to be developed and implemented to recognise digital modularised and micro-learning in TVET and skills development**, so as to support the introduction of more flexible programmes and pathways.
5. **Innovative ways of using digital technologies for workplace training should be developed**. These might include the use of VR and AR as well as project-based virtual placements.

[2] Note that this is over and above the general guidance on using digital technologies for effective learning recommended elsewhere in this report.

Examples.
Examples and resources for effective use of digital technologies in vocational training include:

- Atingi, a German Development Cooperation platform, which provides digital learning materials, including those relating to vocational training and employability. Young people are able to make use of the resources at any time, free of charge and regardless of location, https://www.atingi.org/en/tool.
- GIZ-Project YES Kosovo, including online training on Competence Based Education and Training for teachers, as well as use of AR for training in welding, https://www.giz.de/en/worldwide/66634.html.
- Pro-Educação – GIZ funded basic and vocational education and training project in Mozambique, particularly in support of girls and women https://www.eskills4girls.org/pro-educacao-basic-and-vocational-education-and-training/
- OIT CINTERFOR (no date) *Recursos digitales de las institucviones de la red de OIT/Cinterfor*, https://www.oitcinterfor.org/node/7750.
- Omar Dengo Foundation, http://fod.ac.cr/nuestro-trabajo/.
- UNESCO-UNEVOC (no date) *OER in TVET Resources*, Bonn: UNESCO-UNEVOC, https://unevoc.unesco.org/home/commented+list+of+platforms+and+services&conte.

Suggested further reading

- Achtenhagen, C. and Achtenhagen, L. (2019) The impact of digital technologies on vocational education and training needs: an exploratory study in the German food industry, *Education + Training*, 61(2): 222-233, https://www.emerald.com/insight/content/doi/10.1108/ET-05-2018-0119/full/html.
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- SFIVET : IV4VET – Interactive Videos for Vocational Education and Training

https://www.sfivet.swiss/project/iv4vet-interactive-videos-vocational-education-and-training.

- UNESCO IITE (2003) *Analytical survey: the use of ICTs in Technical and Vocational Education and Training*, Moscow: UNESCO IITE, https://iite.unesco.org/pics/publications/en/files/3214613.pdf.

Developed in collaboration with the International Labour Organization (ILO)

Guidance Note: Ensuring rigorous monitoring and evaluation of initiatives using digital technologies in education for the most marginalised [1]

Context

It is widely agreed that "monitoring and evaluation" are essential for effective improvement and quality assurance in the use of digital technologies in education systems, but almost equal agreement that insufficient good quality monitoring and evaluation is actually done.[2] This was one of the underlying reasons for DFID and the World Bank creating the EdTech Hub initiative, to bring together better understandings of how digital technologies can be used to support education outcomes across the economically poorer countries of the world.[3]

The first step that governments need to take in implementing effective review systems pertaining to the use of digital technologies in education is to differentiate clearly between *monitoring* and *evaluation*:

- Monitoring is the continuing, ongoing process through which participants (teachers, learners, administrators, and partners) in any initiative reflect on all aspects of its progress, and seek to implement improvements that will result in better educational outcomes;
- Evaluation is usually seen as an "end of project" assessment of delivery against a set of original goals, and is usually undertaken by external evaluators (consultants) at the behest of a funder (donor or government) to indicate whether or not value for money was achieved, and also hopefully to share good practices more widely through the system (although this rarely happens).

In many ways, it is actually the regular monitoring by those involved in the education system itself that is of most importance in practically improving delivery for the teachers/facilitators and learners on the ground. All too often, though, it is the evaluation on which most effort and resources are expended, since such projects are frequently funded by donors in some form or another, and they need to prove to their stakeholders that money has been spent wisely.

To improve both monitoring and evaluation, it is important to learn from previous initiatives, and for governments not to make the same mistakes that others have made in the past. The following lists of things not to do and things not to forget are helpful reminders of this.

Things *not* to do

- Don't embark on monitoring and evaluation unless the appropriate funding is in place (this should be at least 10% of a project budget).

[1] Lead author Tim Unwin. This Guidance Note builds heavily on material in Wagner, D.A., Day, B., James, T., Kozma, R.B., Miller, J., and Unwin, T. (2005) *The Impact of ICTs in Education for Development: a Monitoring and Evaluation Handbook*, Washington DC: *info*Dev, http://www.infodev.org/infodev-files/resource/InfodevDocuments_9.pdf.

[2] This is despite repeated emphasis of the point over many years. See, for example, the work of Education Impact at the WISE Summit in 2010, "Monitoring and evaluation of ICT in Education initiatives: reflections from WISE", https://unwin.wordpress.com/2010/12/08/monitoring-and-evaluation-of-ict-in-education-initiatives-reflections-from-wise/.

[3] https://edtechhub.org.

- Don't try to rush the implementation of ICT for education initiatives, and forget to include monitoring and evaluation; both monitoring and evaluation need to be built in from the very beginning, and not done as an afterthought.
- Don't simply monitor and evaluate for the sake of it; don't measure for the sake of measuring.
- Don't impose a punitive management structure that seeks to use monitoring and evaluation primarily as a way of negatively criticising performance (of individuals and of institutions).
- Don't focus exclusively on the digital technology; remember that it is the learning outcomes that are of most importance.
- Don't allow self-reporting to be the only way to evaluate learning in a target population; and don't only use external people for monitoring and evaluation.
- Don't just focus on the evaluation, and forget about the all-important monitoring and self-improvement.
- Don't just use one method or approach; remember that quantitative and qualitative methods provide different explanations and understandings of a process.
- Don't try and cut costs by using inexperienced evaluators who don't have appropriate experience in monitoring and evaluating the use of digital technologies for education.

Things *not* to forget

- Don't forget that "culture is local" and both monitoring and evaluation therefore need to be designed within their local geographical and cultural contexts.
- Don't forget to consider the unintended results of an initiative or programme; these may be the most important outcomes, so they need to be specifically sought out.
- Don't forget the diversity of digital technologies – they are not just tablets or mobile phones.
- Don't forget to manage the buy-in process with the key stakeholders involved.

The guidance below builds on some of these reminders to suggest positive things that governments can do to ensure that initiatives that use digital technologies to improve learning by the most marginalised focus on improvement through self-reflection (monitoring), and effectively share good practices and experience (evaluation).

Guidance

The following ten points serve as a key reminder of the most important things that governments should address in designing and promoting effective monitoring and evaluation of digital technology for education initiatives, especially those concerned with the interests of the most marginalised:

1. **Monitoring and evaluation should be included at all stages** in the development of digital technology for education programmes and initiatives
2. Understand and allow for the fact that **although monitoring and evaluation have significant cost, time and human resource implications, they are essential** for the development of successful programmes and initiatives
3. Ensure that **those involved in the monitoring and evaluation are appropriately trained and understand the importance of both monitoring and evaluation**

4. Involve **as many stakeholders as possible** in monitoring and evaluation, and especially the most marginalised
5. **Involve the learners** in any evaluation process (see also Guidance Note on involving learners)
6. **Assess real student learning and educational outcomes** in the context of the curriculum, and don't just focus on the technological inputs.
7. Make sure that **all monitoring, evaluation and assessment instruments are carefully pilot tested** and appropriate to the context in which they are to be used
8. Ensure that you promote the idea that **monitoring and evaluation is about learning from the experience of a programme** so that it can be improved and lessons shared more widely
9. **Disseminate your findings openly and freely** so that others can benefit from your experiences
10. Remember to focus on **equity issues and how digital technologies have improved relevant learning outcomes for the most marginalised**

Examples.

Examples of interesting monitoring and evaluation activities include:

- Fundación Omar Dengo, Investigación y Evalucaión, Informática Educativa, http://www.fod.ac.cr/index.php?option=com_content&view=article&id=1&Itemid=161.
- Jigsaw Consult (2014) MBRSLP Research 2013-2014, https://www.pdffiller.com/299517646-MBRSLP-research-2013-2014pdf-Jigsaw-Consult-Document-Mohammed-Bin-Rashid-Smart-Learning-smartlearning-gov-Various-Fillable-Forms.
- UNICEF, EduTrac in Uganda, https://www.unicef.org/uganda/what-we-do/edutrac.

Suggested further reading

- Newman, D., Jaciw, A.P. and Lazarev, V. (2017) *Guidelines for Conducting and Reporting EdTech Impact Research in US K-12 Schools*, Palo Alto: Empirical Education and ETIN.
- UNESCO (2016) Designing effective monitoring and evaluation of education systems for 2030: a global synthesis of policies and practices, Draft document, http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/ED/pdf/me-report.pdf.
- Unwin, T. (2018) Why we don't really know very much about the influence of ICTs on learning and education, https://unwin.wordpress.com/2018/07/16/why-we-dont-really-know-very-much-about-the-influence-of-icts-on-learning-and-education/.
- Wagner, D.A., Day, B., James, T., Kozma, R.B., Miller, J., and Unwin, T. (2005) *The Impact of ICTs in Education for Development: a Monitoring and Evaluation Handbook*, Washington DC: infoDev, http://www.infodev.org/infodev-files/resource/InfodevDocuments_9.pdf

Guidance note: Ensuring that children are safe when using digital technologies for learning [1]

Context

Digital technologies are all too often seen as bringing nothing but positive benefits. As this Report has emphasised throughout, though, this is a dangerous myth, and for any benefits to be achieved by the use of digital technologies in education it is essential for governments to put in place measures to mitigate the harms that they can be caused through their use. Such harms are both intentional and unintentional. Moreover, what is seen in one culture as a benefit, may be seen in another as a harm. There is thus rather little international agreement on what should or should not be permitted on the Internet, on how this should be managed or policed, and who should be responsible for this. However, the one area that most jurisdictions and governments can agree on is that children should not be harmed through their use of digital technologies in general, and the Internet in particular. This is therefore one area where positive international collaboration can be encouraged and built upon.

Children and young people are disproportionately affected by the threats of the digital world. Potential harms, including hate speech, online pornography, sexual abuse and harassment, bullying, and other forms of unwanted behaviour are far greater than is usually imagined. In 2019, for example, the UK-based Internet Watch Foundation, registered an increase of 28% over the previous year in the number of reports it confirmed as containing images and videos of child sexual abuse.[2] Almost a third of all webpages actioned by their analysts contained self-generated images, and three-quarters of these showed a girl aged 11-13; 89% of hosting sites were in Europe (including Russia and Turkey). Yet, according to INHOPE only 42 countries currently have a hotline within their network for reporting Child Sexual Abuse Material (CSAM); African and Asian countries are noticeable by their absence from this network. Additional risks include those associated with children's lack of privacy, disinformation, unwarranted data collection and algorithmic analysis of their digital behaviours. There is limited guidance on how children's data should be handled and protected against any unauthorised or unethical future use. Governments should aim to establish and follow a localised, responsive and future-proof child-centred ethical code of practice and companies need to co-operate with them to protect children's privacy and safety.

Access to digital technologies within education systems is one of the main ways through which children both access and also make themselves vulnerable to those seeking to exploit and abuse them through digital technologies. Governments must therefore ensure that they do everything that they can to limit such opportunities, train young people in the safe use of digital technologies, and prosecute those who seek to harm them through its use. Fortunately, there is now an increasing amount of wise advice for governments in how to address these issues. UNICEF's seminal report in 2017 thus highlights that there are three main forms of risk (content, contact and

[1] Lead authors Azra Naseem, Alicja Pawlucsuk, and Tim Unwin.
[2] Internet Watch Foundation https://www.iwf.org.uk/sites/default/files/inline-files/Briefing%20-%20IWF%20Annual%20Report%202019.pdf.

conduct) and that these intersect with three main types of harm (aggression and violence, sexual abuse, and commercial exploitation). They also note that the most vulnerable children tend to be those who are already most marginalised, girls, those from poorer households, those living in communities with a limited understanding of different forms of sexual abuse and child exploitation, those who have disabilities, those out of school, those with mental health problems, and those from other marginalised groups.

Furthermore, the Broadband Commission in 2019 reached consensus amongst its private sector and government partners on five key elements of a universal declaration to affirm their commitment to protect children as they access the Internet. To achieve this goal, and to highlight their responsibility in educating all children for the digital future ahead of them, they asserted that they should:

- "PROACTIVELY Utilize available and develop new innovative technologies to block child sexual abuse material and prevent networks and services, as well as the internal IT environment from being used by offenders to commit violations against children.
- DESIGN Age-appropriate digital services that best meet the needs of children while equipping them to protect themselves online.
- WORK Collectively, across policy, regulatory, the private sector, law enforcement, and national security circles to minimize the risk of violence, abuse, and exploitation of children online.
- PROTECT Children's privacy, security and safety.
- CHALLENGE Existing policies, approaches, mindsets, technology tools, and any medium that knowingly or unknowingly hinder the cause of protecting children, building upon internationally recognized legal recommendations".[3]

Guidance

This guidance identifies the most important first steps that governments need to take to ensure that children can use digital technologies safely to enhance their learning:

1. **The highest priority of governments must be to ensure that all children are provided with appropriate and ongoing training in the safe and acceptable use of digital technologies** before they are introduced to its use in education and learning.
2. Governments must **enact appropriate legislation to prevent the use of digital technologies for the exploitation of children**, and ensure that the police service and other agencies identify perpetrators and bring them to justice.
3. **Governments should ensure that they have mechanisms in place to facilitate international collaboration in child online safety**, both to ensure that good practices are shared and to bring perpetrators of crimes to justice.
4. Governments should ensure that there is a **national hotline for reporting all Child Sexual Abuse Material** (CSAM), and that this is integrated within the INHOPE international network.
5. **National education policies should mandate ministries and schools to provide digital safety training to all those involved in the national**

[3] Broadband Commission/ITU (2019) *Child Online Safety Universal Declaration*, Geneva: ITU, https://broadbandcommission.org/Documents/working-groups/ChildOnlineSafety_Declaration.pdf

education system (officials, administrators, head teachers, teachers, other educational facilitators, learners and parents) **on how to identify child online abuse, how to report it swiftly and in confidence, and how to support those encountering it**.

6. **Safe spaces should be created in all schools and educational institutions** where those suffering from online abuse can escape from digital technologies, learn safely through other means, and gain the skills necessary to participate actively as survivors in digital environments.
7. **Governments should fund media campaigns (TV, radio, social media) in local languages to highlight the issues surrounding child online safety, and how to protect them from harm**. These should aim to create a culture of support for children and their families, and remove the stigma attached to reporting online exploitation and bullying

Examples.

The following examples illustrate interesting initiatives in digital child safety, especially by governments:

- Australia, eSafety Commissioner (2019) *Safety by Design Overview*, Canberra: eSafety Commissioner, https://www.esafety.gov.au/sites/default/files/2019-10/SBD%20-%20Overview%20May19.pdf.
- Broadband Commission/ITU (2019) *Child Online Safety Universal Declaration*, Geneva: ITU, https://broadbandcommission.org/Documents/working-groups/ChildOnlineSafety_Declaration.pdf.
- INHOPE hotlines, https://www.inhope.org.
- ITU (2020) Guidelines on Child Online Protection, https://www.itu.int/en/ITU-D/Cybersecurity/Pages/COP-2020-Guidelines.aspx, including specific guidance for policy makers in multiple languages https://www.itu.int/en/ITU-D/Cybersecurity/Documents/COP/Guidelines/2020-translations/S-GEN-COP.POL_MAKERS-2020-PDF-E.pdf.
- UK Council for Child Internet Safety (UKCCIS), https://www.gov.uk/government/groups/uk-council-for-child-internet-safety-ukccis.
- WeProtect Global Alliance (2018) *Working Examples of Model National Response Capabiliti4es and Implementation*, https://www.end-violence.org/sites/default/files/paragraphs/download/WePROTECT%20Global%20Alliance.pdf.

Suggested further reading

- Alder, R. (2015) 20 tips for creating a safe learning environment, *Edutopia*, https://www.edutopia.org/blog/20-tips-create-safe-learning-environment-rebecca-alber.
- DQ Institute (2020) Child Online Safety Index, https://www.dqinstitute.org/child-online-safety-index/.
- ECPAT International and Religions for Peace (2016) *Protecting Children from Online Sexual Exploitation: A guide to action for religious leaders and communities*, New York: ECPAT International, Religions for Peace, UNICEF, https://www.unicef.org/protection/files/FBO_Guide_for_Religious_Leaders_and_Communities_ENG.pdf.

- Internet Watch Foundation (2019) *Annual Report*, https://www.iwf.org.uk/report/iwf-2019-annual-report-zero-tolerance.
- The Children's Society and Young Minds (2018) *Safety Net: Cyberbullying's Impact on Young People's Mental Health: Inquiry Report*, London: The Children's Society and Young Minds, https://www.alexchalk.com/sites/www.alexchalk.com/files/2018-04/pcr144b_social_media_cyberbullying_inquiry_full_report.pdf.
- UNICEF (2017) *The State of the World's Children 2017: Children in a Digital World*, New York: UNICEF, https://www.unicef.org/publications/index_101992.html.

Guidance note: Partnerships with the private sector and civil society [1]

Context

Partnerships can play an important role in delivering effective educational outcomes through the appropriate use of digital technologies. Experiences through the Covid-19 pandemic will have highlighted many of their potential benefits, but also the challenges associated with implementing them effectively.

Partnerships have at least five main benefits for governments interested in using technology in education:

- Both the private sector and civil society organisations bring important knowledge, skills and experience related to the use of technology in education that may not be found within government departments;
- Key strengths of private sector companies include their understandings of business models, management structures and how to make initiatives sustainable (getting financial support from them should not be the primary interest for governments in engaging with them);
- Civil society organisations bring grounded understanding of challenges in delivering learning opportunities for the most marginalised, and an ability to foster communal engagement;
- Working in partnerships helps share costs and increases mutual synergies and benefits between governments, the private sector and civil society; and
- Such partnerships may help reduce the risks for governments in delivering educational initiatives.

However, partnerships can also carry with them unanticipated costs and potential risks. The most important of these are that partnerships can:

- Become much more expensive than governments originally anticipate, and are often a drain on resources for years longer than expected;
- Benefit the companies involved more than they do the learners, not only in terms of market share and financial profitability, but also in the types of education promoted;
- Lead to governments accepting inappropriate technologies and content, just because they appear to be being provided at reduced costs;
- Lock governments into rigid systems and particular types of technology that become swiftly outdated and redundant; and
- Adversely distort systems of good governance, and encourage inappropriate disbursements of scarce government resources.

In an important and prescient paper, Martens (2007, pp. 5–6) thus highlighted eight key risks associated with the ways in which the term “partnerships” had rapidly become a new mantra shaping UN discourses in the first decade of this century:

- The “growing influence of the business sector in the political discourse and agenda-setting,”

[1] Lead author Tim Unwin.

- "Risks to reputation: choosing the wrong partner,"
- "Distorting competition and the pretence of representativeness,"
- "Proliferation of partnership initiatives and fragmentation of global governance,"
- "Unstable financing – a threat to the sufficient provision of public goods,"
- "Dubious complementarity – governments escape responsibility,"
- "Selectivity in partnerships – governance gaps remain," and
- "Trends toward elite models of global governance – weakening of representative democracy."

Most of these apply even more so now in a post-Covid-19 world, not only at the international level but also nationally in terms of the relationships between governments and the private sector. Governments intending to embark on partnerships using technology for education should therefore always evaluate them with great care to ensure that the benefits for learners do indeed outweigh the disadvantages and challenges.

A useful way of considering such partnerships in a post-Covid-19 era is to weigh up whether any financial savings for governments really do lead to enhanced delivery of intended educational outcomes, especially for the poorest and most marginalised communities. It is often argued that the private sector can deliver such services more efficiently and cost-effectively than can governments. However, concerns arise when private sector profits outweigh any inefficiency losses associated with government delivery for any given quality of educational service.

Guidance

When considering implementing partnerships that use digital technologies in education, it is therefore useful for governments to consider the following ten principles:

9. The partnership should have clear and agreed ***intended educational outcomes***, and these should be agreed by all partners and relevant stakeholders through an inclusive process of dialogue right at the beginning of any initiative.
10. Each partner should be willing to ***share their interests*** in being involved in the partnership, what they expect to gain from it, and what they are willing to commit to it in an open and transparent manner.
11. All formal partnerships should have a single ***senior and charismatic champion***, and the heads of all partner organisations should be committed to it.
12. There should be ***continuity of individual representation*** from each partner organisation at all meetings, at least some of which should be face-to-face.
13. ***Sustainability and scalability*** of the intended development intervention should be built into the partnership design from the very beginning. These will not be achieved if added on as an afterthought.
14. The partnership should be ***realistically costed,*** and partners must agree to commit resources punctually at the relevant time.
15. They should have an appropriately resourced, experiences and staffed ***partnership management team***.
16. They should be built on a ***moral agenda*** that involves ***trust, honesty, openness, empathy and respect***.
17. The relevant ***supportive wider infrastructure*** must be in place to enable ICTs to be used effectively to deliver the intended educational outcomes.

18. They must have in place ***clear and coherent internal and external communication strategies***.

A note on terminology

Partnerships using digital technologies in education often continue to be referred to as *Public-Private Partnerships* (or PPPs). Strictly speaking, these only involve the private sector (companies) and the public sector (governments). Given the crucial importance of civil society organisations, such as teachers' unions and community organisations, in delivering educational initiatives, the term *multi-stakeholder partnerships* (MSPs) has therefore increasingly been preferred. However, literally, this only refers to many different stakeholders being involved, all of which could be from the public and private sectors, thereby once again excluding civil society. For partnerships that are explicitly designed to include all three sectors (governments, companies and civil society) the term *multi-sector partnerships* is therefore to be preferred. This is important because it is increasingly recognised that PPPs fail to deliver on their expectations, and this is often because they exclude civil society organisations necessary for their success.

Examples.

Examples of interesting partnerships using digital technologies for education from which important lessons, both positive and negative, can be learnt include:

- The World Economic Forum's *Global Education Initiative* (2003-11) (see Unwin, T. and Wong, A. (2012) *Global Education Initiative: Retrospective on Partnerships for Education Development 2003-2011*, Geneva: World Economic Forum)
- *The NEPAD e-Schools Demonstration Project* (See Farrell, G., Isaacs, S. and Trucano, M. (2007) *The NEPAD e-Schools Demonstration Project: a work in progress*, Vancouver and Washington: COL and *info*Dev)

Suggested further reading

- Cassidy, T. (2007) *The Global Education Initiative (GEI) Model of Effective Partnership Initiatives for Education*, Cologny: World Economic Forum.
- Principles for Digital Development, https://digitalprinciples.org/principles/.
- Geldof, M., Grimshaw, D.J., Kleine, D., and Unwin, T. (2011) What are the key lessons for ICT4D partnerships for poverty reduction?, London: DFID, https://assets.publishing.service.gov.uk/media/57a08aba40f0b6497400072c/DFID_ICT_SR_Final_Report_r5.pdf.
- Global Partnership for Education (2020) A one-of-a-kind partnership, https://www.globalpartnership.org/.
- Martens, J. (2007). *Multistakeholder partnerships: Future models of multilateralism*? Berlin, Germany: Friedrich Ebert Stiftung, https://library.fes.de/pdf-files/iez/04244.pdf.
- Tennyson, R. (2011) *The Partnering Toolbook*, 4th ed. Oxford: The Partnering Initiative (IBLF) http://thepartneringinitiative.org/wp-content/uploads/2014/08/Partnering-Toolbook-en-20113.pdf.
- Stibbe, D. and Prescott, D. (2020) *The SDG Partnership Guidebook*, The Partnering Initiative and UNDESA, https://www.thepartneringinitiative.org/wp-content/uploads/2020/04/The-SDG-Partnership-Guidebook-v0.9.pdf

- True Educational Partnerships (2020) How EdTech is changing the education landscape, https://www.trueeducationpartnerships.com/schools/how-edtech-is-changing-the-education-landscape/
- Unwin, T. (2015) MultiStakeholder Partnerships in Information and Communication for Development Interventions, in *International Encyclopedia of Digital Communication and Society*, Chichester: Wiley, 634-44

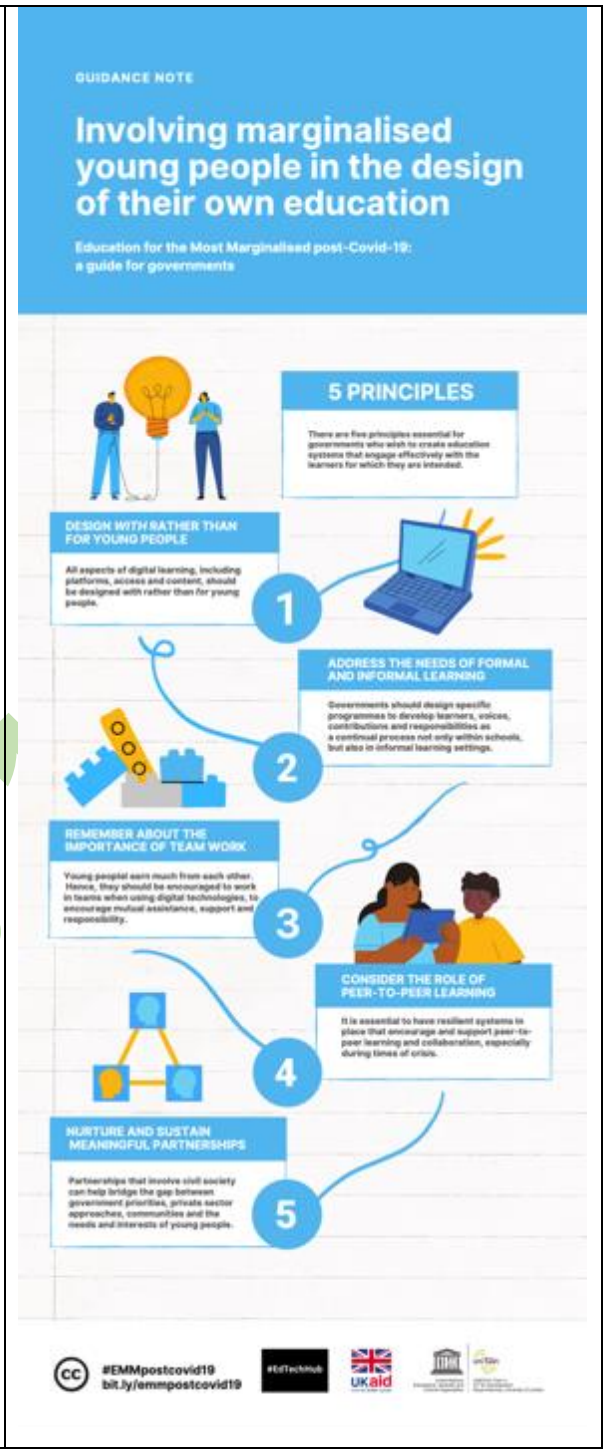
Annex 4
Examples of infographics and slide-decks that can be developed based on the Guidance Notes in Act Three [1]

Infographics

Digital Technologies and girls' education

[1] All graphics designed by Alicjia Pawluczuk

Involving marginalised young people in the design of their own education



Slide decks

Guidance Note

Digital technologies and girls' education

Education for the Most Marginalised post-Covid-19: a guide for governments

#EdTechHub

UKaid

There has long been growing concern about the imbalances between men and women's access to digital technologies, and their engagement in the tech sector at all levels.

Digital technologies and girls' education

The digital gender divide represent far deeper social and cultural structures, and unless these are changed the increasing use of digital technologies – as accelerators – will serve to increase rather than reduce such inequalities.

This guidance note encourages governments to adopt a two-pronged approach:

To focus specifically on ways through which digital technologies can themselves serve to include rather than exclude girls and women in education

To address the wider issues surrounding the involvement of women in the tech sector.

03

The guidance below focuses on the most important first steps that governments can take specifically to reduce gender digital inequalities in learning through digital technologies, and also to encourage the wider engagement of women in the science and technology sectors.

04

Governments should ensure that girls have as equal access to digital technologies (both devices and content) as do boys throughout the education system.

Governments should ensure that there is appropriate legislation, enforcement and guidance to help protect girls and women from all forms of abuse, bullying and harassment through digital technologies.

Clear guidance should also be provided in locally relevant languages and images for girls about the safe use of digital technologies.

Governments should focus explicitly on culturally specific ways through which they can empower girls to become informed and proactive agents of future social and technological change.

Governments should ensure that they collect gender disaggregated data with respect to digital technologies, so that they can accurately monitor changes in gender digital inequality.

Governments should ensure that they put in place effective initiatives to change men's attitudes towards women and digital technologies; emphasis should not be placed simply on providing programmes to support girls and women in technology.

Governments should encourage education to be seen as a collective and networked experience, in which learners, parents, guardians, educators and facilitators all have important roles to play, and all of whom require appropriate digital access and skills training.

Be careful and selective in choosing the most relevant and appropriate digital "solutions" for girls.

There are very many organisations offering digital "solutions" for girls' education, and great care is needed in selecting those that are most relevant and appropriate for girls and women in your own context.

Examples of successful women should be used appropriately in all educational content.

Women scientists, for example, should be shown as often as men scientists in textbooks and online content.

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