Education Development Trust

Transforming lives by improving education around the world

What are countries doing that already use remote learning extensively? What can we learn from them?

Susy Ndaruhutse, Emma Gibbs & Rachael Fitzpatrick

With input from Ed Gaible

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Section 1: Executive Summary

Scope of study

- This report provides a rapid evidence summary of the history, evolution, coverage, impact (successes and challenges) of remote learning in four countries with sustained prior experience, namely Bangladesh, Singapore, South Korea and the United States.
    - For Bangladesh, the focus will be on the English in Action programme, specifically looking at two main components: (i) the professional development of primary and secondary school teachers through mobile learning; and (ii) an adult learning component – in this case, BBC Janala broadcasts – to teach communicative English. This programme used remote learning to improve teachers' pedagogical skills and competency in English alongside learning in the classroom.
    - For Singapore and South Korea, the focus will be on tech-supported remote learning to supplement classroom learning and how this prepared the countries to move to remote learning in response to Covid-19.
    - For the United States, the focus will be on:
        - Education television provided privately through the Sesame Workshop, which is aimed at pre-school and the early grades of primary school. It has extensive reach and a strong focus on reaching the disadvantaged, and covers education and psychosocial support.
        - Virtual charter schools: there are 500 virtual schools enrolling around 300,000 students in the virtual K-12 school sector in the USA.
- The literature used is largely 'grey', including policy documentation at national level, but reach and impact data is included where possible.
- Common themes will be pulled out, including, where possible:
    - The extent to which educational content is relevant, quality-assured and linked to national curriculum, as well as how it is linked (assessment, attainment, topics covered, etc.) and how it includes recognition of education attainment (e.g. with the possibility of moving up a year once completed).
    - The extent to which content pertains to long-term sustained use of remote learning, rather than remote learning as a supplement or complement to face-to-face learning.
    - The role of the teacher (e.g. presence, mediation, interactions, monitoring, assessment).
    - The types of training and/or support given to teachers as they move from face-to-face to remote teaching.
    - The extent to which approaches address specific needs of marginalised children (e.g. language of instruction, access to technology) or those with special educational needs or disabilities (SEND).
    - The extent to which approaches involve working with parents and communities to support children's learning and to hear feedback on what is/is not working.
    - How any technological gaps and challenges have been addressed, especially for those less digitally connected.

  - Any cost/rollout challenges.
- Lessons learnt from these countries/initiatives that could be useful for the Covid-19 response.

Key themes

Drawing on the case studies presented in this report, in combination with recent lessons learned from the Covid-19 response highlighted in earlier EdTech Hub reports, we see the following themes emerging:

Collaborating across government and in public-private partnerships in order to build preparedness for a switch to remote or blended learning. The establishment of Access to Information (a2i) in the ICT Division of the Government of Bangladesh, along with the work completed under the English in Action programme over the last decade (to (i) popularise educational television content and (ii) build the capacity of state broadcasters to produce a cadre of producers and technicians) has resulted in cross-government collaboration,. This was demonstrated by the government's rollout of education television content for students within a week of Covid-19 school closures. In South Korea, there has been strong collaboration between the government and telecommunications companies for the creation of smart learning systems and services. Meanwhile, whilst focused solely on the private sector, the US-based Sesame Workshop – similarly to Bangladesh – demonstrates the importance of education experts and media production experts working together, alongside child psychologists, to produce high-quality broadcasting of high-quality and relevant content. These examples all highlight the importance of technology experts working alongside education experts.

Investing in building national digital capacity. Sustained external or internal R&D investment may be required to build the infrastructure and capacity required for governments (at federal or state level) to be able to support the mass rollout of virtual learning. In Bangladesh, this involved a ten-year £50 million external investment in the education and media sector, as well as external investment to establish a2i. The Government of Singapore and the Government of South Korea have both prioritised investment in ICT, and specifically education technology, through a series of national plans over the last 25 years, which have enabled both countries to use remote learning quite extensively to supplement face-to-face learning. In addition, due to regular school closures as a result of heavy winter snowfall, a district in the north-eastern US had a well-developed backup online learning system that it could easily switch to in response to Covid-19. In all these examples, the switch to remote learning has been easier and quicker because the necessary digital capacity was already established and could be built upon.

Providing guidance for teachers on how to support remote learning. Singapore and South Korea have both provided guidance for teachers on remote learning. In South Korea, the MoE guidance includes its expectations of teachers, as well as advice on how to set assignments and give feedback on work. The MoE has also established a remote community of practice for teachers, 'Teacher On', in which teachers can exchange ideas and examples of good practice.

They have also able to draw on key roles within the education system – the SMART education leads – to coordinate teacher professional development efforts during the crisis. In Singapore, a pilot approach was used before nationwide school closures, enabling the government to gather valuable feedback before ramping up the programme. In the US, the National Standards for Quality Online Learning have been created and made publicly available for teachers to access. Moving to remote or blended learning will be a new way of operating for many teachers, and requires a different approach to face-to-face teaching in a physical classroom: all these examples demonstrate the importance of providing guidance and support to teachers as they manage this transition.

Supporting parents to help their children with remote learning. In Bangladesh, a2i is planning to provide guidance to parents to help engage their children in remote learning. UNICEF is supporting Bangladesh in this and is conducting similar work in Pakistan.[1] In the US, the Sesame Workshop provides resources on a dedicated website to support families and communities with different aspects of remote learning. In all of these cases, support for parents creates a joined-up approach to remote learning, in which parents and caregivers can reinforce the work that teachers are doing.

Negotiating lower-price (or free) internet access for educational sites from network providers to make it more affordable for families. In Bangladesh, BBC Janala negotiated with all six mobile phone networks to ensure reduced data costs for educational material. This provides a key lesson that can be applied to other countries as they roll out remote learning in response to Covid-19: reduced data costs help to manage household (and MoE) costs of educational continuity planning. This is an approach that has also been successful in Rwanda's Covid-19 response and used by several US states or districts.

Providing technological equipment and/or internet access for disadvantaged families to ensure continuity of learning. As part of the Covid-19 response, the government of South Korea has supported low-income families to reduce the cost of internet connectivity, as well as supporting third sector computer equipment-lending services. In the US, some districts have provided disadvantaged students with Chromebooks, while others have parked Wi-Fi-enabled buses in local communities to provide hotspots for communities without broadband.

Ensuring broadcasting presenters and content are inclusive and representative of the audience. In the US, the Sesame Workshop worked hard from the outset to promote inclusion and to have strong representation from different racial and ethnic groups, as well as from children with disabilities and other types of disadvantage. This is a particular learning point if remote learning has to be sustained for long periods and has a heavy reliance on television or radio broadcasting. The Sesame Workshop's language and approach to inclusion have also helped to bring different people and groups together, rather than delineating "us" and "them". This helps inform the thinking and behaviour of children, teachers and communities and provides a good practice model in discussing and responding to Covid-19 in education.

[1] UNICEF Pakistan. (2020). Pakistan COVID-19 Situation Report 23rd-29th March. Islamabad: UNICEF. https://reliefweb.int/report/pakistan/pakistan-covid-19-situation-report-reporting-date-23-29-march-2020

Section 2: Country examples

Bangladesh

English in Action programme

Since 2008, Bangladesh has been using remote learning at scale for non-formal learning for adults and to support teacher professional development. It has done this primarily through the £50.7 million English in Action programme, a DFID-funded programme that aimed to raise the English language skills of 25 million people in Bangladesh to help them improve their livelihoods. This review focuses on two components of this programme: (i) a school-based component to improve English teaching and learning in primary and secondary schools, including the professional development of primary school teachers through mobile learning, and (ii) an adult learning component – BBC Janala – to teach communicative English. It is important to note that this programme never intended to provide remote education in a formal context for students.

The programme was designed and implemented with sustainability and affordability in mind. As a result, for the school-based component, teacher training costs are comparable to the Government of Bangladesh's unit costs, and for the adult learning component, costs are affordable even for those in less advantaged socio-economic groups.[2]

(i) The professional development of primary and secondary school teachers through mobile learning

One component of the English in Action programme was the use of mobile phones to create and share audio and video resources, which were supplemented by print-based resources, to support the professional development of primary and secondary school teachers on a one-year programme.[3] This component exceeded targets in the numbers of teachers and students reached and use of Communicative Language Teaching (CLT) approaches in teachers' classroom practice. By the end of the intervention, there was a 19 percentage point increase in the English language competence of primary students in the Trinity Grade Examination in Spoken English (GESE) level 1 or above (increasing from 29% to 58%) and a 2 percentage point increase in GESE level 2 or above (increasing from 9% to 11%). For secondary students, there was a 12 percentage point increase in GESE level 2 or above (increasing from 40% to 52%) and a 2 percentage point increase in GESE level 3 or above (increasing from 26% to 28%). In addition, 56% of adults tested (including teachers, as well as other adults looking to improve their English language competency) showed measurable improvements in their English language competency score for speaking and listening. Students and teachers had also increased motivation to learn English and much lower perceptions about the difficult of learning English.[4]

[2] DFID (2018). *Project Completion Review, English in Action (2008-18)*.
[3] Ibid.
[4] Ibid.

(ii) BBC Janala

Another component of this programme was BBC Janala ("window" in Bangla), a multiplatform service that worked through around 6,000 English clubs across the nation. BBC Janala included the following platforms:

- **Mobile:** by dialling 3000 from a mobile, users could have access to audio lessons and SMS quizzes. Negotiations between BBC Media Action and all six of Bangladesh's mobile operators resulted in reduced tariff of 50 Paisa (£0.004) per minute. The target population was 15-to-42-year olds.
- **Website:** a dedicated website contained lessons and quizzes, educational downloads and interactive on-line learning.
- **Television:** weekly shows and dramas were produced on national television. In 2009-10, this included a weekly show for young people (BBC Buzz), presented in Bangla and English; a 24-episode weekly drama called *Bishaash* (Believe); and a 24-episode weekly game show, *Janala Mojay Shekha* (Learning with Fun). In 2011, a second series of the interactive game show was also produced. *Bishaash* reached 20 million viewers.
- **Printed materials:** lessons were available in print four times per week in *Prothom Alo*, the leading Bangla daily newspaper, and were also made available across the country in two books and four audio CDs.

A later phase of the project included the *Amar Engreji* (My English) courses, which used the four approaches described above to reach adult learners. They included learning tools to track progress. The final phase included three week-long training workshops to develop the skills of English language teachers and media practitioners.

BBC Janala attained and exceeded targets for audience motivation and engagement in English language learning (reaching 10.25 million people, of whom 54% were female), audience outreach goals (28 million accessed BBC Janala and 44 million were aware of BBC Janala products), and the development of high-quality educational media products across multiple platforms (for instance, the creation of 110 episodes of television shows).[5]

Critical success factors

Critical success factors of the programme included its extended project duration (ten years), significant funding (£50.7 million), and its flexible and adaptable design and implementation, which included regular cycles of review and learning. As well as the direct impact the programme had on improving English language competency amongst students, teachers and the broader adult population, the programme recruited a cadre of individuals within the national broadcast media and developed their skills through training, media workshops, production competitions and work placements on BBC Janala productions. This resulted in substantially increasing the capacity and capability of the media sector in Bangladesh.[6]

[5] DFID (2015). *English in Action, Adult Component 2008-2014 Project Closure Review.*
[6] DFID (2018).

How has learning from these two components helped the Government of Bangladesh in its education Covid-19 response?

As Covid-19 arrived in Bangladesh, the Government was able to build on the strong foundations laid through the English in Action programme. This seems to have strongly influenced its emerging education continuity plan and the prioritisation of television broadcasting within this plan. The plan has been developed with close collaboration between the Ministry of Primary and Mass Education, the Department of Secondary Education and Higher Education and the ICT Division of the government, specifically a unit called Access to Information (a2i).[7] a2i has established four technical working groups (radio, television, internet and mobile phone), each with responsibility for planning the implementation of remote learning during and after Covid-19. It is also developing the Education Hub – a digital platform to host educational resources for schools and parents, and a communication strategy to help parents to engage with their children's learning and disseminate messages about online safety to parents and children. Within refugee camps at Cox's Bazaar, UNICEF is providing print-based materials to support parents to teach their children.[8]

At primary level, television broadcasting of pre-recorded 20-minute lessons for Grades 2-5 started on 7th April 2020, covering English, Mathematics and Science. Plans are in place for a further two-month schedule, which will also include provision for students in other grades.[9]

At secondary school level, within a week of schools closing, the Government started using daily television broadcasting – "My School in My House" – for remote learning for secondary students (Grades 6-10). Classes run for three hours in the morning and three hours in the afternoon, with schedules announced via print and online media, news outlets, social media and television broadcast.[10] Trained teachers present live or pre-recorded classes in core subjects (English, Mathematics, Science and Bangla) with some supplementary subjects, and each class lasts from 20 to 45 minutes.[11] By 13th April, 200 pre-recorded subject-based episodes had been produced for students in Grades 6-10, with a further 1,200 planned episodes for future recording.[12]

BBC Janala's model of working with mobile phone networks to ensure either free or reduced data costs for educational material is likely to be particularly important to future components of the

[7] Access to Information (a2i) is a unit within the ICT Division of government which was established in 2007 as part of a UNDP-supported programme under the government's Digital Bangladesh agenda. It aims to simplify public service delivery. For more information, see https://a2i.gov.bd/
[8] UNICEF Bangladesh (2020). *COVID-19 Response Plan for Cox's Bazar April-Sept 2020.* Dhaka: UNICEF.
[9] Personal communication from Golam Kibria, Education Head of Section, DFID Bangladesh.
[10] Dhaka Tribune (2020). *BTV, Sangsad TV to air lessons for secondary level students from Sunday.* 28th March 2020. https://www.dhakatribune.com/bangladesh/2020/03/28/btv-sangsad-tv-to-air-lessons-for-secondary-level-students-from-sunday
[11] Sarkar, S. (2020). *Attending classes on TV screen.* The Financial Express, 6th April 2020. https://thefinancialexpress.com.bd/views/attending-classes-on-tv-screen-1586186174
[12] Personal communication from Golam Kibria, Education Head of Section, DFID Bangladesh.

Government of Bangladesh's emerging educational continuity planning. However, it is important to note that only 51% of the population have access to mobile phones,[13] 67% of the population have no internet access, with a large majority of internet users using mobile technology to access the internet.[14] In 2010, 46% of households had a television; this figure was 76% for those living in urban areas and only 32% for those living in rural areas.[15] Whilst these figures are likely to have improved over the last decade, the large rural-urban disparity suggests that the government should also consider radio – a more accessible medium – as part of the educational response.

Singapore

Background: Singapore's integration of ed-tech into education reform

Singapore has pursued education reform systematically throughout its history as an independent city-state, planning over the last 25 years for the use of ed-tech to enable students to achieve 21st Century skills. Singaporean students ranked first in PISA scores for reading, mathematics and science in 2015. In addition, over the past 20 years, the Singapore Ministry of Education (MoE) has trimmed syllabuses to provide teachers and students with more opportunities to develop problem-solving skills, creativity and other 21st Century competencies.

The Singapore MoE has launched many ed-tech initiatives over the past 25 years, all of them consistent with the vision of a knowledge society and economy. A recurrent feature in these ed-tech initiatives has been the concept of using ICT to promote and facilitate self-directed learning among children of all age groups.

The consistency of vision and planning by the Singapore MoE has been undergirded by the release of a series of ICT masterplans. These plans specify both the guidelines for ed-tech projects and, most critically, the educational objectives that these projects are to be measured against. These masterplans have been sponsored by the Infocomm Development Authority (IDA), which has also co-sponsored development of the education masterplans with the MoE. Developments outlined in these plans – in both education and the economy – facilitate participation by the Singaporean private sector. The below table provides a brief overview of each plan.

[13] Thorpe, P., and Supaporn, R. (2017). *Protecting children on the move in Asia through ICT and social media.* Singapore: Save the Children Asia Regional Office. https://resourcecentre.savethechildren.net/node/12372/pdf/protecting_children_on_the_move_in_asia_online_version.pdf

[14] Kader, R. (2019). *The Mobile and Internet Penetration Growth Continues, Internet's Deployment Phase.* The Future Startup, 31st January 2019. https://futurestartup.com/2019/01/31/mobile-and-internet-penetration-updates-internets-deployment-phase/

[15] Hasan, K. (2010). *TV 2010.* Forum, The Daily Star, June 2010. http://archive.thedailystar.net/forum/2010/june/TV.htm

ICT Masterplan	Description
Masterplan 1 – 1997-2002	The first ICT Masterplan laid the foundation for technological developments in schools. The plan aligned with the MoE's vision of "Thinking Schools, Learning Nations", with four overarching goals: • Deepen linkages between the school and the world • Encourage creative thinking, lifelong learning and social responsibility • Engender innovation in education • Augment efficiency in communication for administrative and management excellence.[16] Aligning with these principles, ICT played a major role, particularly in primary schools and in the development of digital media repositories that contained educational resources. In addition to providing basic ICT infrastructure in schools, teachers were also trained in new technologies. By 2002, all teachers had been trained.
Masterplan 2 – 2003-2008	The second ICT Masterplan moved toward self-directed learning. The three goals were: • Redesign the curriculum to fully integrate ICT • Move from a teacher-centric pedagogy to learner-centric pedagogy • Allow schools to have greater autonomy in utilising their ICT funds to customise their ICT implementation.[17] The MoE worked with the Infocomm Development Authority of Singapore (IDA) to deliver a series of programmes in accordance with Masterplans, such as Future Schools and EdVantage Programme.[18]
Masterplan 3 – 2009-2014	The third ICT Masterplan aimed to build on the previous two by seeking to integrate technology even further into the curriculum, assessment and pedagogy. The core tenet of this plan was to enhance the self-learning capabilities of students, so they are able to tailor learning to their own needs.
Masterplan 4 – 2015 onwards	Masterplan 4 has built on previous learning, with the addition of embedding 21st Century skills. According to the MoE, Masterplan 4 uses ICT: "productively to develop knowledge through subject mastery, skills through 21st Century Competencies, and attitudes through responsible digital citizenry. mp4 [Masterplan 4] is also aligned to MoE's direction towards student-centric and values-driven education."[19]

[16] Toh, Y., and So, H. (2011). ICT reform initiatives in Singapore schools: a complexity theory perspective. *Asia-Pacific Education Review*, 12, pp.349-357. Page 351.
[17] Ibid. Page 352
[18] Ibid.
[19] Singapore Ministry of Education (2020*a*). *ICT Masterplan 4 Overview.* https://ictconnection.moe.edu.sg/masterplan-4/overview

Singapore's experimental approach

Singapore has adopted an experimental, responsive approach to integrating technology into schools, keeping track of innovations and new developments that take place globally. It has enabled trials of technological innovations in schools prior to national deployment, and schools have been given the power to be innovative and take risks in integrating technology both inside and outside classrooms. Moreover, 'Future Schools' were pioneered in Singapore in 2007.[20] This joint initiative between the IDA and the MoE sought to partner with big technological institutions, for students to be more experimental with ICT in a less structured learning environment. Students in these schools bypassed General Certification of Education (GCE) examinations at Grade 10, allowing them to spend more time on these less structured, technology-focussed activities.

Crescent Girls School was one of Singapore's Future Schools. Students each have their own devices, and teachers reportedly use technology "seamlessly" for both group work and self-directed learning.[21] The school had partnered with Microsoft in 2004 to adopt their m-learning project, which involved 1:1 computing.[22] The school has continued to adopt innovative approaches to the integration of technology after the Future Schools initiative came to an end, particularly in promoting self-directed learning through technology. However, there is limited publicly available information on how learning from this school was transferred to other schools or integrated into future policies and initiatives.

Self-directed learning

Supporting students' self-directed learning is a key component of Singapore's ICT masterplans, and technology is a core feature of their vision. A report released by the MoE suggested that students need to be capable of self-directed learning, particularly to "identify, manage and mobilise resources for learning and the ability to monitor their own progress in learning."[23] There is some evidence of increased activity around students designing their own experiments in Singaporean schools,[24] but overall, it is unclear exactly what self-directed learning looks like in an average school in Singapore.

Examples of self-directed learning using mobile technology

Self-directed learning has taken different forms for different age groups, though analysis of how it has been implemented in practice in most schools is largely absent from publicly available sources. One

[20] Lim, M. (2015). 'How Singapore teachers in a pioneer 'School of the Future' context 'deal with' the process of integrating information and communication technology into the school curriculum.' *Australian Educational Researcher*, 42, pp.69-96. Page 71.
[21] Ibid.
[22] See Crescent Academy for Digital-Age Learning website https://www.crescent.edu.sg/cradle/crescent-academy-for-digital-age-learning
[23] Chee, T.A., Divaharan, S., Tan, L. and Mun, C.H. (2011). *Self-directed learning with ICT: Theory, practice and assessment.* Ministry of Education, Singapore. https://ictconnection.moe.edu.sg/ictconnection/slot/u200/mp3/monographs/self-directed%20learning%20with%20ict.pdf Page 6.
[24] OECD (2011). *Measuring Innovation in Education: Singapore Country Note.* Paris: OECD. https://www.oecd.org/education/ceri/Measuring-Innovation-in-Education-Singapore.pdf Page 4.

way in which self-directed learning has taken place has been through mobile learning, both inside and outside classrooms. To analyse the effect of this pedagogy, a series of research studies were conducted by the Learning Sciences Lab to see how mobile devices could be used in different learning scenarios. The first scenario related to 'reduce, re-use and recycle', where students would use their devices outside the classroom in their everyday lives to help them apply environmental and scientific concepts to the real work.[25] For example, children would take photographs when going to supermarkets to observe packaging used on food, interview customers and look at alternative options. The study into this initiative found that student content knowledge increased after using technology to engage with the topic in a real-world setting. Another scenario investigated by the Learning Sciences Lab involved students using mobile devices to facilitate learning on a school trip on the Chinatown Trail. [26]

Self-directed learning and ICT use at different grades and readiness levels

In 2011, the MoE released a report called *Self-directed learning with ICT: theory, practice and assessment*.[27] This report suggests that children of all age ranges are capable of self-directed learning, but the extent to which it is possible depends on both the student and the teacher. The report suggests that:

> *…at lower degrees of self-direction, the teacher makes decisions about learning outcomes of the lesson. At the point the teacher feels that students may be able to articulate their individual learning outcomes, he or she can provide support in helping the students to sharpen or narrow down their desired learning outcomes.*[28]

This implies that the extent to which self-directed learning is possible is more dependent upon subjective 'readiness' levels than age boundaries. The report also suggests that students should be able to self-assess their learning using forms. Younger children may potentially need the items of the forms explaining to them, and their comprehension may be aided by the use of smiley face icons in place of numerical Likert scales. Student self-assessment of self-directed learning behaviours include responses to statements such as: 'I complete my schoolwork on time' and 'I find out more than what my teacher teaches me in school'.[29]

Primary 1 learning outcomes were identified in the Primary Education Review and Implementation (PERI) committee report in 2009. A qualitative study was conducted in Greenridge Primary School that demonstrated the learning outcomes that are expected of students by the end of term 3, including the following in relation to ICT:

[25] So, H-J., Kim, I. and Looi, C-K. (2008). 'Seamless mobile learning: possibilities and challenges arising from the Singapore experience.' *Educational Technology International*, 9:2, pp.97-121. http://www.webinar.org.ar/sites/default/files/actividad/documentos/nij08_5.pdf
[26] Ibid.
[27] Chee, Divaharan, Tan, and Mun (2011).
[28] Ibid. Page 6.
[29] Ibid. Page 48.

- Can switch on and shut down a computer
- Can log in to the school's system using own username and password
- Can identify the basic parts of a computer
- Can login to the e-learning portal
- Can complete assignments in the e-learning portal
- Can send email to teachers and friends.[30]

The above learning outcomes feature self-directed learning, and the ability for students to be able to communicate with teachers and complete tasks from the e-learning portal. Self-directed learning for young learners is therefore focused on equipping them with the skills and understanding of technology to enable them to engage more independently as they get older.

Singapore's response to Covid-19

Given Singapore's strong emphasis on ICT in their education reform programmes and initiatives over recent decades, they were arguably in a good position to transition to home-based learning. However, given how recently this shift took place, it is not possible to draw any meaningful conclusions on how effective this has been. The Singapore government's response to COVID-19 has been phased. On 27 March, the Singapore government announced schools were to transition to blended learning, staggered by school level.[31] Schools were to provide students and parents with materials to continue learning from home. The MoE issued a press release that switched to home-based learning through video conferencing and use of the national online platform (Singapore Student Learning Space). The MoE then moved to full home-based learning, no longer offering a blended approach.

In addition, the MoE has also addressed the issue of assessment, as national exams have now been impacted. The April 3rd press release stated:

> *With HBL [home-based learning], school-based assessments and examinations for the year will need to be adjusted where necessary. All school-based Mid-Year Examinations will be cancelled. However, national examinations, including the mid-year GCE O- and A-Level Mother Tongue Language examinations in June, Year-End Examinations and Primary School Leaving Examinations will proceed as planned and with the necessary precautionary measures in place.*[32]

[30] Singapore Ministry of Education (2009). *Primary Education Review and Implementation PERI Committee March 2009.* https://planipolis.iiep.unesco.org/en/2009/report-primary-education-review-and-implementation-peri-committee-5141 Page 69.
[31] Singapore Ministry of Education (2020*b*). *Schools to Implement One Day of Home-Based Learning a Week.* Press release, 27th March 2020. https://www.moe.gov.sg/news/press-releases/schools-to-implement-one-day-of-home-based-learning-a-week
[32] Singapore Ministry of Education (2002*c*). *Mid-year Holidays Brought Forward as Schools Adjust Academic Calendar; Institutes of Higher Learning to Extend Home-based Learning.* Press release, 21st April 2020. https://www.moe.gov.sg/news/press-releases/mid-year-holidays-brought-forward-as-schools-adjust-academic-calendar-institutes-of-higher-learning-to-extend-home-based-learning

While the details on this move to a full home-based learning delivery approach have still to emerge, it is clear from the country's history of education reform that the system is well equipped to deliver education in a way that has ed-tech at the centre of its approach.

Strategies for ensuring equity and supporting the most vulnerable

The MoE has released multiple statements that indicate students with additional needs will receive special measures to ensure they can access the required support. In a press release on 27th March, the MoE stated: "We will also put in place additional measures to help students with higher needs or who require more support for home-based learning."[33] It is not clear what these measures entail, and whether technology has been used in different ways for the most vulnerable learners.

South Korea

Background

The South Korean education system is one of the finest in the world, as demonstrated by its strong PISA results. Ed-tech has been strongly supported by the government for over 30 years, and forms a significant part of government strategy to reform the education system to focus on developing students' 21st Century skills[34] and using the latest cutting-edge technology.[35] There is a high level of technology coverage in South Korea. In 2017, Korea ranked second worldwide in terms of technology access (ICT infrastructure), level of ICT usage, and the level of ICT skills in the general population (usage).[36]

South Korea's first School Computer Master Plan was introduced in 1987, focussing on ensuring the basics were in place. A further four education Master Plans have followed:[37]

- **ICT in Education Master Plan I (1996)** focused on building ICT infrastructure and developing guidelines for ICT in education in primary and secondary schools and the creation of key institutions, including EDUNET.
- **ICT in Education Master Plan II (2001)** focused on developing and distributing ICT teaching content and improving teaching methods in order to embed e-learning and pave the way for remote schooling.
- **ICT in Education Master Plan III (2006)** sought to develop ubiquitous learning and so-called Smart Education through interventions such as the Digital Textbook Development Plan.

[33] Singapore Ministry of Education (2020*b*).
[34] Correspondence with Edmond Gaible.
[35] Kim, J and Jung, H. (2010). 'South Korean Digital Textbook Project.' *Computers in the Schools*, 27:3/4, pp.247-266.
[36] Budhrani, K., Ji, Y. and Lim, J.H. (2018). 'Unpacking conceptual elements of smart learning in the Korean scholarly discourse.' *Smart Learning Environment,* 5, 23.
[37] KERIS (n.d.). *ICT in Education of Korea* [PowerPoint presentation] http://scpd.gov.kw/archive/ICT%20in%20Education%20of%20Korea.pdf

- **ICT in Education Master Plan IV (2010)** focused on customised learning, including the further development of SMART Education, through SMART Model Schools and the SMART Education Strategy.

Key reforms successes and challenges

The Korean Education Research and Information Service (KERIS)

The Korea Education Research and Information Service (KERIS) was established in 1999, replacing two existing technology-focused education institutions. It was intended to focus on driving the widespread development and implementation of education and ICT policies.[38] This was not the first entity to be created by the MoE as part of its ongoing policy plans around ICT in education. However, it is one of the longest lasting, and is therefore a key institution in the South Korean education system as a whole. Crucially, it is the main institution supporting ongoing system reform to embed and develop the use of ICT in the education system and meeting the government's ambitious goals in this area.

KERIS' mandate is to promote the use of ed-tech use in schools, primarily through these key activities:

- Organisation and operation of a national e-learning system (EDUNET)
- Supporting the development of personnel in relation to 21st Century skills
- Supporting the improvement of classroom teaching and public education more generally through the use of ICT
- Management of user-centred knowledge and information resources though the Research Information Sharing Service
- Supporting the cyber learning system.[39]

A World Bank report highlighted the successes of KERIS, particularly in relation to a number of initiatives developed by the institution to support remote learning.[40] The report highlights the key factors that have ensured these successes. Firstly, KERIS was created as a quasi-governmental entity, embedded within the MoE, with a strong mandate to drive forward the government's goals in relation to the wide-scale use of ICT. The ministry and KERIS often work in collaboration with each other in order to demonstrate the strength of this mandate, particularly when working with regional entities on ICT-related matters.[41]

[38] Kwon, Y. and Jang, S. (2016). *Building and sustaining national ICT education agencies: lessons from Korea (KERIS).* World Bank Education, Technology and Innovation: SABER-ICT Technical Paper Series no. 3. Washington DC: The World Bank. https://openknowledge.worldbank.org/bitstream/handle/10986/26089/112903-NWP-Agencies-Korea-KERIS-SABER-ICTno03.pdf?sequence=1&isAllowed=y
[39] https://www.keris.or.kr/eng/cm/cntnts/cntntsView.do?mi=1175&cntntsId=1342
[40] Kwon and Jang (2016).
[41] Ibid

The strong mandate and wide-reaching goals of KERIS could not have been managed by the institutions that had preceded it because they had been focused on a different set of goals, mainly oriented towards improving infrastructure. The World Bank argues that it is better to create a new institution than to change the mandate of existing ones, even if those existing institutions' goals are partially aligned. In addition, the World Bank recommends that in order to strengthen the mandate of organisations such as KERIS, it is imperative that a strong legal framework exists to underpin the work of the institution and to ensure that the wider system is ready and willing to cooperate and collaborate.[42]

EDUNET (national online education content repository)

EDUNET was established in 1996 by one of KERIS' predecessors. The platform provides education materials (including multimedia materials) for both teachers and students at primary and secondary level.[43] EDUNET has a number of key features. Firstly, it is a national repository that collects, quality assures and shares teaching materials from all regions of the country, ensuring that a wide-range of curriculum-linked content is available. Secondly, KERIS has invested resources in collaborating with relevant institutions across South Korea and internationally to ensure that content is up-to-date, useful and relevant. Thirdly, the platform allows for knowledge exchange, including the functionality for students and teachers to exchange ideas and experiences with other schools and classrooms across the country.[44]

The Cyber Home Learning System (CHLS)

The Cyber Home Learning system is a flagship initiative of KERIS and has widely been considered a success. The initiative was launched in 2004 with the aim of harnessing the widespread accessibility of technology across the country, to encourage self-directed learning amongst students and bridge the educational divide.[45] This was a particular concern in South Korea, where private after-school tutoring is extremely popular amongst students from more affluent socio-economic backgrounds. The introduction of the CLHS was therefore supposed to reduce those families' reliance on private tutoring, while simultaneously providing students from less well-off socioeconomic backgrounds with access to additional educational content and support.[46]

The initiative was developed and funded centrally (by KERIS and the MoE) but implemented in close collaboration with regional governments, in order to ensure that it met the needs of each of the regional contexts.[47] Generally however, the CHLS consisted of a number of core components geared towards self-directed learning, including support from an online study content, online Q&A, access to

[42] Ibid.
[43] Hwang, D.J., Yang, H-K and Kim H. (2010). *E-Learning in the Republic of Korea.* UNESCO Institute for Technologies in Education. Moscow. https://iite.unesco.org/pics/publications/en/files/3214677.pdf
[44] Ibid.
[45] Kwon and Jang (2016).
[46] Hwang, Yang and Kim (2010).
[47] Ibid.

an online tutor, achievement tests and career counselling. The system also allowed parents to engage with their child's home learning.[48]

The CHLS has been a highly successful and popular initiative, with the number of users growing rapidly since its inception. While studies do not find that the CHLS has significant positive effects on students' learning outcomes on its own, it is thought to be an important supplement to more traditional modes of teaching.[49] Evaluations suggest that student satisfaction and engagement with the service have grown significantly over time.[50]

SMART learning

In recent years, the South Korean government's focus has centred on the concept of SMART learning. The introduction of the *Promotion Strategy for Smart Education*, announced in 2011, was a wide-reaching reform aiming to enhance the learning experience of students and prepare them for life in the 21st Century, by ensuring that education is individualised, supportive of creativity and harnessing the best technology. Underlying the reform is a broad initiative focussing on embedding learning as a lifelong process, with an emphasis on ensuring that education can meet the individual needs of South Korean learners. It was designed to build on previous programmes that allow learning to happen anywhere – not just in the classroom, but also at home and in the community.[51] The implementation of the reform thus had implications for the whole education system – the environment, contents, teaching methods and evaluation.[52,53]

The concept of SMART education has two key areas, the SMART classroom, and online education:[54]

1. **SMART classroom:** the SMART classroom is the primary learning environment for SMART education and applies in general education, special educational needs, and disability contexts, across all subjects. SMART classrooms are equipped with technology that allows differentiated learning for all students and for effective teacher supervision of student work. The pedagogical model for SMART classrooms emphasises creative experiential activities using technology, student-centred learning techniques and technology-enabled communication, and collaboration with students from a wide range of other contexts/backgrounds.

[48] Ibid.
[49] Shin, J. H. and Albers, P. (2015). 'An Analysis of the Effect of a Cyber Home Learning System on Korean Secondary School Students' English Language Achievement and Attitude.' *TESL Canada Journal*, 32(2), 45.
[50] Kwon and Jang (2016).
[51] Se-hwan, B (2017). *Smart classroom is the future of school.* The Korea Herald, 15th August 2017. http://www.koreaherald.com/view.php?ud=20170814000591
[52] KERIS (2015). *2015 White Paper on ICT in Education Korea.* Seoul: KERIS. https://oldkeris.keris.or.kr:442/english/whitepaper/WhitePaper_eng_2015.pdf
[53] Budhrani, Ji and Lim (2018).
[54] UNESCO (2011). *Classroom revolution through SMART education in the Republic of Korea: case study by the UNESCO-Fazheng project on best practices in mobile learning.* Paris: UNESCO. https://unesdoc.unesco.org/ark:/48223/pf0000366729

2. **Online model:** The online model focuses on selective subjects, intensive courses, acknowledgement of class attendance, and supplementary courses. It deals with expanding learning and allows students the right to choose learning. It also aims to help reduce the education gap. In this model, an online teacher delivers the instruction and develops learning materials. There is also a class tutor to support the online classroom. Various instructional methods are used.

A major element of the SMART learning reform was to ensure that teachers had ongoing professional development and support in delivering the SMART learning model in classrooms, including knowledge of new technologies to be introduced in the classroom. KERIS and the MoE developed a new curriculum for teacher training, designed to strengthen learner competencies in the changing learning environment, with a particular emphasis on creativity, cooperation, communication skills, critical thinking and problem solving. A cascade model was used to train selected teachers as lead SMART education teachers and spread the concept of SMART education. These teachers then returned to metropolitan and provincial offices to act as leads for their areas, where they trained teachers at the school level. Alongside this cascade model, various events were held to increase awareness amongst teachers and to develop case studies, alongside special lectures. Official training courses were also available (off- and online) in all provinces.[55]

Evaluation studies of the SMART learning model seem to suggest that the value of the approach does not necessarily lie in improving learning outcomes for students. Most studies found no significant difference in learning outcomes in comparison to business as usual. However, assessments have been performed to identify changes in student capabilities by SMART education, especially the use of digital textbooks. They have found that SMART education has led to improvements in certain skills, such as problem solving and communication. Improvements were also observed in skills such as creativity, ability to innovate, critical thinking and information utilisation.[56] Another study, focused on the teacher capacity-building aspect of the initiative, has demonstrated positive shifts in teaching ability of the participating teachers for SMART education.[57]

However, a number of challenges of the approach have also been highlighted, including some physical side effects associated with increased technology use (e.g. eye, neck, and wrist conditions) as well as issues linked to student wellbeing, such as overuse of gaming and deterioration in memory.[58]

In terms of implementation challenges, some studies have commented on a high degree of pushback from teachers who were not convinced of the benefits of the move to SMART learning and concerns about the effect of increased technology use on interpersonal relationships. Since teacher buy-in was crucial to the success of the programme, the government put significant effort into building public awareness and buy-in to the reform.[59]

[55] Ibid.
[56] Ibid.
[57] KERIS (2015). *2015 White Paper on ICT in Education Korea.* Seoul: KERIS. https://oldkeris.keris.or.kr:442/english/whitepaper/WhitePaper_eng_2015.pdf
[58] Ibid.
[59] Ibid.

Digital Textbooks

The Digital Textbook Initiative was a major programme to accompany the larger SMART Learning reform announced by KERIS in 2007. This was a large and relatively complex programme involving technical innovation, as well as improved infrastructure, teacher training and new system-wide quality assurance processes. As such, the programme was implemented using a phased approach, described below:

- Feasibility study/pilot looking at digital textbook use in real classroom settings and development of core digital texts
- Training and capacity building for teachers in effective use of the textbooks
- Building infrastructure to support digital textbook use, including the distribution of tablets to all students, and wireless internet access in school buildings
- Developing a distribution system, quality assurance system, and standards for textbook content (this also addressed legal requirements and frameworks to prevent copyright issues and hacking)
- Introducing an incentive system for teachers, providing rewards to teachers who demonstrated exemplary use of digital textbooks in teaching
- Establishing an evaluation system.

Digital textbooks go far beyond traditional versions, combining content that can be tailored to students' individual interests and abilities, with interactive functions and the ability to cross-reference with other sources (reference books, workbooks, dictionaries, etc).[60]

The major benefit of digital textbooks is that they are available at school and at home, thus supporting the MoE's goal of allowing students the right to choose what they learn and where. There is also a high degree of interaction with the textbooks, meaning that students can create/alter the textbook content – adding notes, highlights and combining additional content they find and thus supporting students to learn in a way that works for them.[61]

There are mixed results when comparing the effectiveness of digital textbooks with traditional textbooks (some studies show no difference, whilst others show improved outcomes for those using digital textbooks combined with differentiated instruction). However, there does seem to be evidence to suggest that they improve students' interest, comprehension, satisfaction and self-efficacy.[62,63] Pre- and post-tests conducted in 2016 show that students' creativity and innovation ability, critical thinking ability, and information literacy ability were improved after using digital textbooks.[64]

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[60] Kim, J and Jung, H. (2010). 'South Korean Digital Textbook Project.' *Computers in the Schools*, 27:3/4, pp.247-266.
[61] Ibid.
[62] Ibid.
[63] Joo, Y., Park, S., Shin, E. (2017). 'Students' expectation, satisfaction and continuance intention to use digital textbooks.' *Computers in Human Behaviour*, 69, pp. 83-91.
[64] Kim, T.; Cho, J.Y.; Lee, B.G. (2013). 'Evolution to Smart Learning in Public Education: A Case Study of Korean Public Education.' In: Ley T., Ruohonen M., Laanpere M., Tatnall A. (eds) Open

A 2017 study noted overwhelmingly positive perceptions of digital textbooks by teachers. It found that teachers thought that the textbooks were especially effective in improving student concentration, interest, and self-directed learning attitudes. They also highlighted the effectiveness of digital textbooks for supporting differentiation in class. However, there were some negative results associated with digital textbooks, including increased evidence of students being distracted from their work, as well as physical issues, such as eyestrain.[65]

One of the major drawbacks of digital textbooks is that, because they are so comprehensive and include multiple types of content on one topic – text, multi-media, interactive assessment, video, sound, virtual reality etc. – they can be very challenging and costly to update.[66]

South Korea's Covid-19 response

South Korea's initial medical response to the Covid-19 crisis has been lauded for its decisiveness and apparent effectiveness.[67] However, its education response has also been impressive, as we have seen in earlier EdTech Hub reports.[68] South Korea's strong tradition of using ed-tech in education may have meant it was better prepared for a rapid response to the crisis.

School closures were one of the earliest measures introduced by the government. The closures initially coincided with the school holidays, and then eventually delayed the start of the new term to 9th April. Once the new term started, students were taught online, with remote support from teachers. A pair of MoE press releases[69] outlined the wider strategy on home schooling, which included:

- Setting up virtual platforms, including access to academic content and the means to provide daily instruction to students, using the existing EDUNET and CHLS systems
- ICT support for disadvantaged students, including provision of equipment where needed and support for Wi-Fi/internet bills
- Setting expectations of teachers, including guidance on how they are to set assignments and comment on work
- Establishing the 'Teacher On' initiative, a remote community of practice run by existing SMART education leads

and Social Technologies for Networked Learning. OST 2012. *IFIP Advances in Information and Communication Technology*, Vol 395. Springer, Berlin, Heidelberg

[65] Cho, K. (2017). 'Analysis of Teacher Perceptions of Digital Textbook Use in Korea Pilot Schools.' *International Journal for Educational Media and Technology*, 2017, 11:1, pp.76-81. http://jaems.jp/contents/icomej/vol11/09_Cho.pdf

[66] Kim, J and Jung, H. (2010). 'South Korean Digital Textbook Project.' *Computers in the Schools*, 27:3/4, pp.247-266.

[67] South Korea's Foreign Minister explains how the country contained COVID-19 https://www.weforum.org/agenda/2020/03/south-korea-covid-19-containment-testing/

[68] See for example, Joynes, C., Gibbs, E. and Sims, K. (2020). *An overview of emerging country-level responses to providing educational continuity under COVID-19: What's working? What isn't?* https://edtechhub.org/wp-content/uploads/2020/05/whats-working-whats-not.pdf

[69] Korean Ministry of Education (2020). *The New School Year Begins with Online Classes.* MoE Press Release, 13th April 2020. http://english.moe.go.kr/boardCnts/view.do?boardID=265&boardSeq=80297&lev=0&searchType=null&statusYN=C&page=1&s=english&m=0301&opType=N

- In addition to the 'Teacher On' initiative, developing the '10,000 Communities' online platform for teachers, which will allow them to share good practice
- Implementing a process of ongoing review involving both central and provincial government.

Though no detailed commentary has yet emerged on how South Korea's response to Covid-19 was influenced by its existing approach to ICT in education – and indeed remote learning – we can make a number of strong assumptions about the factors which may have contributed to the relative success of its approach. Firstly, South Korea has a dedicated institution and strong legal framework already in place which supports the education response to Covid-19. Secondly, South Korea had already developed the online infrastructure, resources and practice to support self-directed learning and learning at home (through EDUNET and CHLS, in particular). Thirdly, South Korea had already made a significant investment in ensuring that every child had access to a laptop or tablet device, to enable them to use digital textbooks. This would likely have made it easier to hone in on the gaps, particularly ensuring that disadvantaged and vulnerable students had access to technology. Finally, South Korea was one of the few countries to emphasise support, guidance and ongoing professional development for teachers during its Covid-19 response. This is likely because there was already a strong foundation in place for this: teachers have already received basic training to use technology and there are key stakeholders in the system whose role it is to act as ed-tech leads, cascade knowledge on remote learning and to support the sharing of good remote teaching practice amongst other teachers.

United States

Example 1: Sesame Street and the Sesame Workshop

Sesame Street was founded in 1966 against the backdrop of the Civil Rights movement and the War on Poverty, with the aim of using television to help prepare disadvantaged children for school using animations, songs and real stories, with the help of puppets. At the end of its first season of programmes in 1969, it had been watched by millions of pre-schoolers. Building on this success, in 1971, the Sesame Workshop[70] created *The Electric Company* to focus on improving literacy in seven-to-ten-year-olds.[71] Within a decade, nine million American children under the age of six were watching the daily episode.[72] Since these early beginnings in the US, which rapidly spread into Latin America, the Sesame Workshop has expanded its work to over 150 countries. It currently provides informal education to over 150 million children.[73]

The Sesame Workshop uses television programmes with academic and psychosocial content to build school readiness. This is supported by online games and resources on a dedicated website, as well as regional websites for specific countries. In the state of Georgia in the US, the

[70] The Sesame Workshop was known as the Children's Television Workshop until 2000.
[71] https://www.sesameworkshop.org/who-we-are/our-history
[72] https://www.sesameworkshop.org/who-we-are/our-history/sesame-street-history-50-years-impact
[73] https://www.sesameworkshop.org/who-we-are/our-history/sesame-street-history-50-years-impact

Sesame Workshop has partnered with IBM to use Watson for a play and learning platform for early learners. The Gwinnett County Public Schools (an urban school district in Georgia) piloted a cognitive, tablet-based vocabulary learning app that helps identify areas that require additional focus in a personalised way for each learner.[74] The Sesame Workshop also provides family and community support with dedicated resources and games hosted on a website.[75]

Supporting inclusion for the most disadvantaged and socially marginalised

At its roots, the Sesame Workshop has a focus on supporting the most disadvantaged and socially marginalised, with a deep commitment to inclusion. Two African American actors were included in the original cast, with the first Hispanic actor being added two years later. The programmes also welcomed children with disabilities. In 1975, the Sesame Workshop established a series of children's centres in prisons. In 1990, as part of a race-relations initiative, one of the 'muppets' (puppet characters), Elmo, had a conversation with Whoopi Goldberg, comparing and celebrating their different skin colours and textures. Further episodes over the years have promoted mutual respect between different groups.[76] Since 2006, they have been working with military families through bilingual videos, television specials, Sesame Street tours and "Sesame Rooms" in military spaces,[77] and connecting families and providers with psychosocial resources. In 2013, they created an initiative to support the 2.7 million children in the US who have a parent in prison. In 2017, the show introduced a muppet called Julia, who has autism, which has helped reduce the isolating misconceptions around autism. In 2018, the company introduced a new show called *Esme and Roy* that focuses on creative play. Most recently, the Sesame Workshop has partnered with the Chan Zuckerberg Initiative and The Primary School[78], to create a new, holistic pre-school curriculum to help teachers to meet children's academic, physical, social-emotional and mental health needs. Once finalised, this curriculum will be digitised and made available for use in other integrated early learning settings across the US.[79]

In addition to this work in the US, the Sesame Workshop has created television programmes in other countries, using its signature approach to address issues including the stigma associated with HIV/AIDS, conflict-related division, gender inequality (through presenting alternative norms),and the promotion of health and hygiene, as well as specific content for refugees.

Covid-19 town hall

Most recently in the US, in response to Covid-19, Sesame Street and CNN partnered to create and broadcast a special 90-minute Saturday morning 'town hall' for children and parents on

[74] IBM (2017). *IBM Watson and Sesame Workshop introduce intelligent play and learning platform on IBM cloud.* IBM press release, 6 June 2017. https://www.ibm.com/watson/education/sesame-street
[75] https://sesamestreetincommunities.org/
[76] https://www.sesameworkshop.org/who-we-are/our-history
[77] https://sesamestreetformilitaryfamilies.org/
[78] This is a school that was set up in 2016 to provide holistic early years support to disadvantaged families in East Palo Alto, California. See https://www.theprimaryschool.org for more information.
[79] https://www.sesameworkshop.org/what-we-do/schools/chan-zuckerberg-initiative

coronavirus, providing an opportunity for families to learn more about the pandemic and to ask questions. The programme featured experts alongside Sesame Street characters and covered issues such as anxiety, education, screen time and play dates.

Core features

The Sesame Workshop uses both formative and summative research to undertake annual reviews of the curriculum which has been built into the production since its inception in 1969. Content is created by a mixed team with expertise in education, child psychology and the media, and it is designed to match the learning needs of the target population. Particular attention is given to the demographics of the target audience: the cast reflects the diversity of the viewers, being inclusive of different racial and ethnic groups. When planning broadcasts in new countries, the creators have followed core educational principles, but have taken local context and culture into account in both the content and visual aspects of the show. As the target audience for the broadcasts is pre-school-aged children, the focus is on school readiness, rather than following a particular national curriculum.

Impact

A meta-analysis looking at the effects of Sesame Street on children's learning in 15 countries[80] (excluding the US) found a statistically significant and positive effect of exposure to Sesame Street on literacy, numeracy and analytic outcomes (d = .284).[81]

Within the US, analysis of the impact of Sesame Street in two counties of California[82] showed positive effects of the broadcasts on several outcomes, including a sizeable impact equivalent to around an additional full year of learning in primary school, on the Peabody Picture Vocabulary Test, a standardised test used to measure cognitive performance.[83] The positive effects were particularly pronounced for boys and for black, non-Hispanic children, as well as for children who grew up in economically disadvantaged counties. This is consistent with Sesame Street's goal of preparing children for school and its particular focus on black and disadvantaged children. This was achieved at an annual cost of around US$5 per child.[84] In terms of longer-term impact, however, the study did not find statistically significant differences in academic or socio-emotional development for these students at the end of secondary school.

[80] Mares, M.L. and Pan, Z. (2013). 'Effects of Sesame Street: A meta-analysis of children's learning in 15 countries.' *Journal of Applied Developmental Psychology*, 34, pp.140-151.
[81] Taking into account different study designs, viewing contexts and learning outcomes, this means that children who watched more Sesame Street scored 29 per cent of a standard deviation higher than those who watched less.
[82] Kearney, M. and Levine, P. (2019). 'Early childhood education by television: lessons from Sesame Street.' *American Economic Journal: Applied Economics*, 11:1, pp.318-350.
[83] Ibid. Page 323.
[84] Ibid. Page 343.

Example 2: Virtual Charter Schools

Across the US, in the 2017-18 academic year, there were around 300,000 students enrolled in more than 500 full-time virtual schools in the K-12 school sector. Many of these were charter schools, outside of the control of the state district.[85] Studies looking at the academic outcomes of virtual schools generally show a negative impact on learning outcomes[86], but with the caveat that many of these schools serve a disadvantaged constituency of students who have often faced challenges learning in a traditional school setting. A 2019 report by the National Education Policy Center, drawing on a major study of virtual charter schools from 2015 by Mathematica research[87], suggested that one of the reasons for poor learning outcomes may have been that courses were self-directed and personalised and did not draw sufficiently on effective remote pedagogy, with students struggling with the absence of face-to-face or real-time online interaction with other students and teachers.[88] Good practice in online teaching in virtual schools in Michigan highlights the importance of a teacher's regular interaction with students in instruction, assessment and support, arguing that:

> "The same characteristics that apply in face-to-face certainly apply in virtual, but in addition to the face-to-face skills, a virtual teacher has to have some knowledge of technology. Just to operate the management system for the course delivery requires training and practice."[89]

Quality standards for virtual schools

In 2007, the Southern Regional Education Board (SREB), a not-for-profit organisation working to improved education across 16 southern states in the US, developed National Standards for Quality Online Courses, Programs and Teaching.[90] These standards are used as benchmarks in schools and districts providing online learning. In 2019, drawing on a literature review and consultations with stakeholders and users, it updated these to produce National Standards for Quality Online Learning.[91] As stated on the National Standards Quality website, in light of Covid-19,

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[85] Molnar, A., Miron, G., Elgeberi, N., Barbour, M.K., Huerta, L., Shafer, S.R. and Rice, J.K. (2019). *Virtual Schools in the U.S.* Boulder, CO: National Education Policy Center.
[86] As well as Molnar et al. (2009), see also a study on the state of Indiana, Fitzpatrick, B., Berends, M., Ferrare, J.J., and Waddington, J. (2020). 'Virtual illusion: comparing student achievement and teacher and classroom characteristics in online and brick-and-mortar charter schools.' *Educational Researcher*, 49:3, pp.161-175.
[87] Gill, B., Walsh, L., Wulsin, C.S., Matulewicz, H., Severn, V., Grau, E., Lee, A. and Kerwin, T. (2015). *Inside on- line charter schools.* Cambridge, MA: Mathematica Policy Research.
[88] Molnar *et al.* (2009). Page xiii.
[89] DiPietro, M., Ferdig, R., Black, E., and Preston, M. (2008). 'Best practices in teaching K-12 online: lessons learned from Michigan Virtual School teachers.' *Journal of Interactive Online Learning*, 7:1, pp.10-35.
[90] These include Professional Responsibilities, Digital Pedagogy, Community Building, Learner Engagement, Digital Citizenship, Diverse Instruction. Assessment and Measurement and Instructional Design.
[91] National Standards for Quality Online Learning (2019). https://www.nsqol.org/

> *These are essential frameworks for K-12 districts developing quality online learning plans to deal with long-term school closure possibilities.*[92]

The Standards outline some important considerations for teachers in relation to online safety, respecting intellectual property when curating on-line resources, personalised learning linked to individualised learning plans, and the importance of presence – through teacher-student and student-student interactions and visibility. This was highlighted in an early EdTech hub evidence review.[93]

Whilst these standards have existed for over a decade, a 2016 study on online charter schools suggests that no states have effective quality assurance or accountability mechanisms in place.[94] Another study from 2017 concurs that while multiple states do not have accountability measures beyond reporting enrolment and other basic data, Florida is demonstrating good practice, requiring schools to report on a broader range of measures, including performance accountability outcomes of individual students, teachers and schools.[95] This study recommends that policymakers provide better oversight, monitoring and accountability mechanisms, including an improved quality and range of school data.

Example 3: Home schooling

We examined the literature on home schooling, but most of the research is currently on the motivation behind home schooling, rather than the educational outcomes of home school students or the types of curriculum they follow. Less than 4%of the school age population in the US is home schooled,[96] and this mode of schooling works on the premise that a parent is available to act as a teacher and/or mediator of resources. This therefore does not lend itself to applicability and learning for Covid-19 responses and school closures, so we have not pursued researching learning from this for other countries' Covid-19 response.

Learning from US experiences in Covid-19 educational response

Within the US, education is a state-level responsibility, rather than a federal-level responsibility, but even districts within states have had their own localised responses to Covid-19. Some parts of the US are used to school closures at different times of the year due to severe weather.

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[92] Ibid
[93] See McAleavy T., and Gorgen, K. (2020). *Overview of emerging country-level response to providing educational continuity under COVID-19: best practice in pedagogy for remote teaching.* https://edtechhub.org/wp-content/uploads/2020/04/research-best-practice-pedagogy-remote-teaching.pdf
[94] Pazhouh, R. Robin, L., and Miller, L. (2016). 'A policy framework for online charter schools'. *Education Digest*, Prakken Publications, 81:8, pp.49-58.
[95] Beck, D., and LaFrance, J. (2017). 'Online schooling in the United States: a response to Saultz and Fusarelli.' *Journal of School Choice*, 11:1, pp.42-59. Page 52.
[96] Greenwalt, K. (2019). *Homeschooling in the United States.* https://www.researchgate.net/publication/331386435_Homeschooling_in_the_United_States

Former Education Secretary of Michigan, Paul Reville, gave some insights into the parts of the US that were more prepared than others:

> *I think the lessons we've learned are that it's good [for school districts] to have a backup system, if they can afford it. I was talking recently with folks in a district in New Hampshire where, because of all the snow days they have in the wintertime, they had already developed a backup online learning system. That made the transition, in this period of school closure, a relatively easy one for them to undertake. They moved seamlessly to online instruction.*[97]

The information that is available on state or district-level Covid-19 response largely relates to access, rather than educational content and delivery, with commentators noting how the crisis has exposed the scale of inequality in the US.

Addressing the digital divide

Three broad solutions to limited digital access have included:

- Providing free internet to households through internet service providers or by providing hotspots
- Wi-Fi buses providing Wi-Fi to some rural locations and inner-city locations
- Distributing Chromebooks to households.

Glenrock County District, New Jersey, has recognised that many rural households do not have internet access, or at least not consistent enough access for online schooling. Internet service providers have offered two months' free internet to households in the district who are not connected, with the district covering the costs after this initial free period.[98] The County District also plans on purchasing hotspots to distribute to families with poor or no internet coverage. In addition, to reach a larger number of children in the district, Wi-Fi enabled buses are being deployed, each with a 300-feet radius reach. Prior to receiving free Wi-Fi, many students had been receiving "paper packets" of schoolwork to their homes, but the Superintendent of the district noted that this causes inequity that they want to avoid:

> *We don't want there to be inequity of services for a student who's receiving education via an online or virtual means versus someone getting education through paper packets…There's no replacement for face-to-face, but the internet is a lot more three-dimensional... Inequity is an issue with paper packets, and we want to solve that as much as we can.*[99]

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[97] Mineo, L. (2020). *Time to fix American education with race-for-space resolve.* The Harvard Gazette, 10th April 2002. https://news.harvard.edu/gazette/story/2020/04/the-pandemics-impact-on-education/
[98] The Tribune (2020). *Glenrock school district rolls out free internet, WiFi-enabled buses to support virtual learning.* 19th April 2020. https://trib.com/news/local/education/glenrock-school-district-rolls-out-free-internet-wifi-enabled-buses-to-support-virtual-learning/article_df1f8c52-52db-528f-a50b-f44a62dc0a53.html
[99] Ibid.

Offering Wi-Fi through school buses is a solution that has been used across multiple states in the US. In California, there were some questions around the locations of these buses. Some suggestions have been to park the buses in large parking lots, to enable students to sit in their cars and socially distance.[100] In Austin, Texas, school buses have been parked outside apartment complexes with high levels of need, 150 feet apart, to ensure coverage of the entire complex. Some buses have also been distributing Chromebooks to students. South Bend Community School Corporation in Indiana had already equipped their buses with Wi-Fi last November and has repurposed them during the crisis. All students in the district had already received a Chromebook, so were potentially in an even better position than other localities when the crisis started. The Boston Public School system in Massachusetts also purchased and distributed 20,000 Chromebooks to students at the start of the crisis.[101]

Other states and districts have been using their school buses to deliver school meals. In Gwinnett County, Georgia, buses are driving the same routes as usual, stopping in the same places, but instead of picking up children, they are dropping off food.[102]

Some areas in Los Angeles have high levels of deprivation – only 50% of students are estimated to have personal devices they can use for online learning at home, and only 25% of families have internet access at home.[103] As a result, Los Angeles is one district that has partnered with local Public Broadcasting Service (PBS) stations to deliver educational content for K-12 schools through three broadcasting channels, in addition to streaming through websites, YouTube, Google Play and other apps.[104] Digital resources are aligned to state standards and online training will be provided for teachers on how to use them. The daily broadcast schedules are available on PBS' Interconnection system, enabling all PBS stations in the country to access them in the cloud and broadcast them in their locality. In the early stages of lockdown, they had two weeks of programmes planned out. It is not clear whether they have looked at the learning coming from Sesame Street in relation to content and representation of different racial and ethnic groups amongst presenters.

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[100] Hannon, T. (2020). *School Bus Wi-Fi Hotspots Aide Student Learning During COVID-19 Closures.* School Transportation News, 8th April 2020. https://stnonline.com/special-reports/school-bus-wi-fi-hotspots-aide-student-learning-during-covid-19-closures/

[101] Rauf, D. (2020). *Coronavirus squeezes supply of Chromebooks, iPads, and other digital learning devices.* EdWeek, 1st April 2020. https://www.edweek.org/ew/articles/2020/04/01/coronavirus-squeezes-supply-of-chromebooks-ipads-and.html

[102] Gray, R. (2020). *Update: Georgia School District Buses Roll Again on Food Delivery Missions.* School Transportation News, 6th April 2020. https://stnonline.com/news/georgia-school-district-buses-to-roll-again-on-food-delivery-missions/

[103] A highly publicised initiative to distribute 600,000 tablets to students, conceived in part as a way to address inequitable access, was halted due to a range of challenges – see Lapowsky (2015). *What schools must learn from LA's iPad debacle.* Wired, 5th August 2015. https://www.wired.com/2015/05/los-angeles-edtech/

[104] Goldsmith, J. (2020). *PBS steps in with educational programming as Los Angeles schools closed.* Deadline, 13th March 2020. https://deadline.com/2020/03/pbs-socal-kcet-lausd-los-angeles-schools-close-1202883111/

Another district in California, the Fullerton Joint Union High School District in Orange County, had already distributed Chromebooks to students five years prior to recent school closures. Prior to school closures, the district also conducted a needs assessment of students' home learning situation to help them prepare. They were able to identify students who did not have internet access at home and arranged for Wi-Fi hotspots to be delivered ahead of school closures. The district noted the importance of understanding how students' home environments can make it difficult for them to continue studying on the same schedule, so produced more flexible plans to enable students to balance home life (with matters such as supporting younger siblings with schoolwork, or struggling to find a quiet space to study). Teachers in this district have opted for a combination of live-streamed lessons, pre-recorded lectures, video call check-ins with students and a mix of other online resources.[105]

[105] Johnson, S. (2020). *Why distance learning is a success in one California district.* EdSource, 27th April 2020. https://edsource.org/2020/why-distance-learning-is-a-success-in-one-california-district/630051

Section 3: Emerging lessons learnt

Drawing on the case studies presented in this report, in combination with recent lessons learned on the Covid-19 response highlighted in earlier EdTech Hub reports, we see the following themes emerging regarding the effective use of remote learning:

Collaborating across government and in public-private partnerships in order to build preparedness for a switch to remote or blended learning
The establishment of Access to Information (a2i) in the ICT Division of the Government of Bangladesh, along with the work completed under the English in Action programme over the last decade – to (i) popularise educational television content and (ii) build the capacity of state broadcasters to produce a cadre of producers and technicians – has resulted in cross-government collaboration. This was demonstrated by the government's rollout of education television content for students within a week of Covid-19 school closures. In South Korea, there has been strong collaboration between the government and telecommunications companies to create smart learning systems and services. Meanwhile, whilst focused solely on the private sector, the US-based Sesame Workshop – similarly to Bangladesh – demonstrates the importance of education experts and media production experts working together, alongside child psychologist to produce high-quality broadcasts of high-quality, relevant content. These examples highlight the importance of technology experts working alongside education experts.

Investing in building national digital capacity
Sustained external or internal R&D investment may be required to build the infrastructure and capacity required for governments (at federal or state level) to be able to support the mass rollout of virtual learning. In Bangladesh, this involved a ten-year £50 million external investment in the education and media sectors, as well as external investment to establish a2i. The Government of Singapore and the Government of South Korea have both prioritised investment in ICT, and specifically education technology, through a series of national plans over the last 25 years. This has enabled both countries to use remote learning quite extensively to supplement face-to-face learning. Due to regular school closures as a result of heavy winter snowfall, a district in the north-eastern US had a well-developed backup online learning system that it could easily switch to in response to COVID-19. In all these examples, the switch to remote learning has been easier and quicker because the necessary digital capacity was already established and could be built upon.

Providing guidance for teachers in how to support remote learning
Singapore and South Korea have both provided guidance for teachers on remote learning. In South Korea, the MoE guidance includes its expectations of teachers, as well as advice on how to set assignments and give feedback on work. The MoE has also established a remote community of practice for teachers, 'Teacher On', in which teachers can exchange ideas and examples of good practice. They have also able to draw on key roles within the education system – the SMART education leads – to coordinate the teacher professional development efforts during the crisis. In Singapore, a pilot approach was used before nationwide school closures, enabling the government to gather valuable feedback before ramping up the programme. In the

US, the National Standards for Quality Online Learning have been created and made publicly available for teachers to access. Moving to remote or blended learning will be a new way of operating for many teachers, and requires a different approach to face-to-face teaching in a physical classroom: all these examples demonstrate the importance of providing guidance and support to teachers as they manage this transition.

Supporting parents to help their children with remote learning
In Bangladesh, a2i is planning to provide guidance to parents to help engage their children in remote learning. UNICEF is supporting Bangladesh in this and is conducting similar work in Pakistan.[106]In the US, the Sesame Workshop provides resources on a dedicated website to support families and communities with different aspects of remote learning. In all of these cases, this creates a joined-up approach to remote learning, in which parents and caregivers can reinforce the work that teachers are doing.

Negotiating lower- price or free internet access for educational sites from network providers to make it more affordable for families
In Bangladesh, BBC Janala negotiated with all six mobile phone networks to ensure reduced data costs for educational material. This provides a key lesson that can be applied to other countries as they roll out remote learning in response to Covid-19, as it helps to manage household (and MoE) costs of educational continuity planning. This is an approach that has also been successful in Rwanda's Covid-19 response and used by several US states or districts.

Providing technological equipment and/or internet access for disadvantaged families to ensure continuity of learning
As part of the COVID-19 response, the government of South Korea has supported low-income families to reduce the cost of internet connectivity, as well as supporting third-sector computer equipment-lending services. In the US, some districts have provided disadvantaged students with Chromebooks, while others have parked Wi-Fi-enabled buses in local communities to provide hotspots for communities without broadband.

Ensuring broadcasting presenters and content are inclusive and representative of the audience
The Sesame Workshop worked hard from the outset to promote inclusion and to have strong representation from different racial and ethnic groups, as well as from children with disabilities and other types of disadvantage. This is a particular learning point if remote learning has to be sustained for long periods and has a heavy reliance on television or radio broadcasting. The Sesame Workshop language and approach to inclusion have also helped to bring different people and groups together, rather than delineating "us" and "them". This helps to inform the thinking and behaviour of children, teachers and communities and provides a good practice model for discussing and responding to Covid-19 in education.

[106] UNICEF Pakistan. (2020). Pakistan COVID-19 Situation Report 23rd-29th March. Islamabad: UNICEF. https://reliefweb.int/report/pakistan/pakistan-covid-19-situation-report-reporting-date-23-29-march-2020

Section 4: Recommendations

Drawing on the learning from these four countries, this report echoes some of the recommendations in three previous EdTech hub evidence reviews on best practice in remote pedagogy, reaching disadvantaged students, and what is working from emerging country-level responses to Covid-19.[107] These include:

1. **Use a variety of means to promote 'teaching presence'**

This may be through either synchronous and/or asynchronous interactions with teachers (e.g. in virtual office hours, or the use of platforms such as Google classrooms, Microsoft TEAMS or Zoom breakout rooms) and other students through on-line learning, and/or through continuity in the face or voice of the central teacher in broadcasting. Effective strategies will need to ensure that teachers provide regular opportunities for interaction, and that they provide guidance and feedback to encourage cognitive engagement and promote active learning. This is particularly important when using a student-directed learning approach.

2. **Provide guidance, training and resources for teachers**

This may be through: (i) the curation of learning resources; (ii) the formation of virtual communities of practice to enable peer-to-peer learning; and (iii) training in how to use different virtual platforms and/or apps to support effective teaching and learning. Teachers may be brilliant at face-to-face teaching but need support in moving to effective online teaching, particularly in contexts where online teaching is not well established.

3. **Encourage cross-sector alliances and public-private partnerships**

Collaboration across government (for example, between an MoE and a ministry of telecommunications or technology) and between the MoE and private sector technology and media organisations, can provide an effective response to support remote learning. In low- and middle-income countries, this may also require the support of development partners. Such collaborations can help to build remote teaching capability through a variety of tech-supported methods. It will be important to ensure clarity on the roles and responsibilities of each player in an alliance, through memoranda of understanding, coupled with regulations to prevent the private sector taking undue commercial advantage of its position in a partnership.

[107] See particularly McAleavy T., and Gorgen, K. (2020). *Overview of emerging country-level response to providing educational continuity under COVID-19: best practice in pedagogy for remote teaching.* https://edtechhub.org/wp-content/uploads/2020/04/research-best-practice-pedagogy-remote-teaching.pdf; McAleavy, T., Joynes, C., Gibbs, E. and Sims, K. (2020). *What steps are being taken to reach the most disadvantaged students during the period of COVID-19 school closure?* https://edtechhub.org/wp-content/uploads/2020/05/disadvantaged-students.pdf; and Joynes, C., Gibbs, E. and Sims, K. (2020). *An overview of emerging country-level responses to providing educational continuity under COVID-19: What's working? What isn't?* https://edtechhub.org/wp-content/uploads/2020/05/whats-working-whats-not.pdf

4. **Prioritise engagement with vulnerable and disadvantaged students and their families/caregivers**

Vulnerable and disadvantaged groups are most likely to fall further behind without additional support and follow-up. Whilst this may need to include tech equipment and internet access for those who do not have it, this is not sufficient and will need to be accompanied by direct and ongoing support from teachers.

5. **Invest in and develop the skills of the middle tier**

These middle-tier roles are key stakeholders in the workforce which will become essential during a crisis response. This is demonstrated in South Korea, where existing SMART education leads, were mobilised rapidly during the COVID-19 response in order to support teachers with the shift to full-time remote learning. Effective crisis management skills and – more specifically – the skills to support a rapid move to remote education during a crisis are a crucial component of systems with the right delivery architecture to communicate, collaborate and pivot effectively.

6. **Respond appropriately and holistically according to context – there is no one-size-fits-all remote learning solution**

Different contexts (including different regions/districts within a country) may require different responses. This is not just about what type of tech is most suitable (no-, low- or high-tech), but also about other factors, such as levels of equity, governance and regulatory structures (federal versus centralised versus decentralised) and past experience and track record with education technology and remote learning. For example, in a federal system like the US, where education decisions are made locally and there is less regulation, a different approach may be required in a more economically deprived, largely urban district, compared with a more remote rural district. By contrast, in a smaller, centralised context like Singapore, with a long track record of education technology, it may be more feasible to follow a largely homogeneous approach across the country.

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