

Leveraging ICT for the Learning Recovery and
Acceleration in Bangladesh

The World Bank Group

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Executive Summary

The onset of the COVID-19 pandemic in March 2020 caused a severe disruption to the global education sector, shuttering schools and other education institutions for long periods of time. The school closures forced students, teachers, and education administrators to use information and communication technologies (ICT) to coordinate and deliver education services. While we have seen technology deployed widely prior to and during COVID-19, open questions remain about the potential of ICT4E in developing country contexts such as Bangladesh including a host of quality and equity-related concerns. Moreover, the challenges faced by the sector in the wake of the school closures are immense. Although the Government of Bangladesh responded to the crisis rapidly by adopting remote learning strategies, these modes of instruction cannot replicate the learning gains of in-school instruction. This report aims to focus on the role(s) that technology can play in Bangladesh to strengthen resilience, improve service delivery, and learning and help address learning loss caused by COVID-19. This report explores how the EdTech space has evolved in Bangladesh, focusing on current ICT4E cases across different domains of the basic education sector, and highlights key constraints to more effective deployment of ICT4E. The study suggests ways that the Government of Bangladesh can leverage EdTech to support the post-COVID learning recovery and the basic education sector in short and medium term for a target audience of a wide range of stakeholders, including the relevant ministries of the Government of Bangladesh, World Bank global practices, and other relevant sector colleagues and development partners, among others.

Enabling environment through government's efforts to strengthen ICT based education service delivery

Over the past 20 years, the Government of Bangladesh (GoB) has adopted numerous initiatives to promote the use of ICT in the education sector as part of an overarching plan to digitize education service delivery. We review the policies and programs that have helped advance ICT for Education in Bangladesh. The most recent of these initiatives is The National Blended Education Master Plan (2022-2041), based on the Blended Education for All (BEFA) framework. The plan aims to combine digital learning with face-to-face learning. The other objectives behind the government's forward-looking plan, developed over 2021 and 2022, are to mitigate the impact of the pandemic and to ensure the well-being of children. ***Role of ICT in measuring and mitigating COVID-19 learning loss and in contributing to education services in new normal situation***

Policymakers and practitioners are rightly concerned with the impact that Bangladesh's extended school closures may have had on student learning. The steep learning losses projected for primary and secondary students underscore the need for policymakers to identify interventions that can stem learning loss and accelerate the learning recovery. Projections prepared by analysts earlier in the pandemic and prior to the 2021 school reopening in Bangladesh reveal the gravity of the situation. While children have returned to in-person instruction, the school system is not sufficiently prepared to address the learning-related challenges they will face.

Key recommendations: using remote, phone-based assessments (low-cost alternatives) to track and monitor student learning progress, assess the effectiveness of interventions, and to direct support where it is needed most; promote adaptive learning platforms leveraging innovations led by private sector; scaling-up good practices on blended learning, ICT based telementoring/tutoring.

Challenges to mainstream access to technology and digital infrastructure to mainstream ICT4E efforts

Accessibility is highly critical as using digital technology was the only option for students to prevent learning loss during the pandemic. In Bangladesh, even television—the most pervasive technology for accessing educational content—can reach only about 50% of households (ITU, 2021), and there is no single technology that covers the entire population in Bangladesh. While more than 99% of households are supplied with electricity, more than 10% of primary schools still do not have access to electricity (Haque, 2021). There is also a clear digital divide between households with and without internet as well as those with and without broadband. In addition to the access challenge, the cost of internet also affects equitable coverage in Bangladesh households.

The government and other stakeholders' efforts to digitize curriculum content have expanded considerably in recent years. While the government was able to distribute remote learning content during the pandemic via technology platforms, much of the content was pre-recorded and did not allow for interaction between the learner and instructor. Lack of interaction has been a key barrier to the adoption of remote learning technologies.

Key Recommendations: exploring subsidizing options building on government and private sector collaboration

Closing the digital divide and improving equity

Inequity challenges remain in EdTech across urban-rural areas, gender and socioeconomic background of households. Rural areas are more disadvantaged from multiple perspectives compared to urban areas and the gap was even larger during the pandemic. Lack of ICT literacy among teachers, parents and overall educators and education sector staff also impacts the overall digital divide. In Bangladesh, a significant gender gap prevails in mobile owners and mobile internet users driven by social norms impacting the female population. While during the pandemic dropout rates increased, driven by a divide in use and understanding of technology as well as students being forced to contribute to family income, Bangladesh has seen positive results to bring back drop-outs through sensitization activities reached to students via basic feature phones.

Key Recommendations: customized solutions (based on rapid assessments) for recovery instead of one size fits all; raising parental awareness and involving community in mainstreaming blended learning; innovating financing mechanism to reduce digital divide

Maximizing ICT4E outcomes through teachers' digital skills improvement

Teachers' digital skills are central to EdTech strategies that the GoB has planned moving forward. The GoB is committed to establishing an ICT-driven curriculum in the education sector (Ministry of Education, 2010) and one part of this strategy was to emphasize on developing teachers' digital skills. However, multiple surveys have revealed that the development of teachers' digital skills is likely to be restricted by a lack of access to relevant digital equipment. During the Covid-related school closures, 50% of teachers in Bangladesh had to use their own mobile data packages to access the internet to deliver teaching. Even where teachers have access to the devices needed for digital skills, teachers often lack the skills needed to utilize them in a pedagogically appropriate way (Khan et al., 2021).

Key Recommendations: Incentivize teachers to gain digital skills; mandating pedagogy-focused pre- and in-service digital skills training for teachers; ensure sufficient digital devices for teachers to effectively put into practice training they receive in digital skills; develop a certification process for accredited courses taken on online TPD platforms

Strengthening overall sector governance, management, monitoring and optimizing time and resources through digital ecosystems

Coordinated and integrated Education Management Information System (EMIS) can save time and resources in overall governance and strengthen informed decision making. The education sector in Bangladesh is familiar with utilizing EMIS systems while there is absence of a unified platform across sub-sectors. The respective ministries/divisions in-charge of education sub-sectors manage respective EMIS separately. Currently, there are four different EMIS systems fragmented through four directorates managing four major sub-groups. Lack of interconnectivity among fragmented EMIS systems is leading to loss of time and resources. There remains capacity building needed for both infrastructure and human resources especially at the field level. Overall procurement related complexities and delays often impact EdTech driven systems development and deployment in Bangladesh.

Key Recommendations: coordination among education ministries and implementing agencies for integrated EMIS deployment; cooperation with higher education institutions for improving inspection of digital device procurement; skills development and ownership of system maintenance

Way forward

Government's commitment and buy-in to maximize learning and other outcomes through leveraging ICT in education service delivery is reflected in recent efforts, programs and policy directives. Effectiveness of these efforts will largely depend on coordination among education ministries, implementing agencies, and their approach towards ICT4E adoption. Teachers should remain at the heart of all transformation in the sector and upskilling the teaching workforce with digital skills will be one of the crucial and deciding factors of successfully integrating ICT in education and roll-out blended learning as planned by the government. Low-cost innovative approach leveraging private sector engagement will expedite capacity building and mainstreaming of digital systems and infrastructure. To better understand the direction in which the education service delivery of Bangladesh is moving, it is important to further explore the landscape of blended learning in Bangladesh and its potential with a deep dive in beneficiary perspective and demand.

Chapter 1: Background and Landscape

When the COVID-19 pandemic began worldwide in March 2020, the Government of Bangladesh and donor partners initiated a robust education sector response to the crisis. Schools, teachers and civil society organizations leapt into action, providing much needed services and support to students. During the crisis, many education sector officials worked overtime on the response which included a set of remote learning programs.

Working in partnership with other education stakeholders, the government broadcasted remote learning content over television, radio and internet. The government's programs were customized for students at different levels of the education system (primary, madrassah, secondary, vocational education). A phone-based remote learning program was planned but not implemented. Despite the government's efforts, preliminary evidence suggests that the reach of even the most widely accessible remote learning programs, such as those aired over Sangsad TV remains limited. For example, a survey of Grade 9 scholarship students conducted in May and June 2020 found that out of listed students only 48 percent of them had access to a television and 39 percent had access to Sangsad TV (Biswas et al, 2020). Out of those who had access, approximately 4 in 10 (43%) watched it in the past week. The government's remote learning efforts during COVID-19 revealed large gaps in internet/mobile connectivity, technical knowledge, access to digital devices, and other inequalities among students and teachers. While we have seen technology deployed widely prior to and during COVID-19, open questions remain about the potential of ICT4E in developing country contexts such as Bangladesh. For example, policymakers are curious as to whether ICT can be used to improve the quality of instruction and deliver better learning outcomes. There are also a host of equity-related concerns that both governments and international stakeholders have expressed. For example, practitioners wonder whether ICT be adopted in ways that do not exacerbate existing inequalities in low-resource contexts. Aside from these issues, governments face a host of practical implementation challenges such as slow procurement processes, imperfect coordination issues across ministries, and a lack of in-house expertise. In this report, we describe how the EdTech space has evolved in Bangladesh, describe current ICT4E use cases across different domains of the education sector, and highlight key constraints to more effective deployment of ICT4E. Finally, we share recommendations for steps that government and other education stakeholders can take to effectively incorporate ICT into education sector operations.

The Bangladeshi Context: Early Vision for ICT4E but Mixed Implementation Progress

Even before the onset of COVID-19, many governments were exploring ways of delivering education through ICT platforms and other applications of technology across the education sector. The Government of Bangladesh had invested in EdTech capabilities, institutions, and internal capacity to a greater extent and much earlier compared to other countries in the region. For example, the government first announced its intention to provide digital services to all of its citizens in the Digital Bangladesh campaign in 2009. Since then, the government has formed institutions to carry out this work, initiated new programs in partnership with development agencies, and articulated ambitious ICT4E goals in a series of official policies. This background work paid dividends during the COVID-19 crisis. For example, the government was able to leverage remote learning platforms that had already been developed such as Teachers Portal and utilize the expertise of agencies such as a2i.

While the government has exerted effort to set objectives for ICT use, it is important to acknowledge that implementation has sometimes lagged the goals as articulated in the government’s ambitious ICT4E plans. The government’s guiding strategy document in recent years has been the Master Plan for Information and Communication Technologies in Education (2012-2021) published in July 2013. A review of the master plan conducted by the Government of Bangladesh in 2018/2019 with support from UNESCO provides a detailed breakdown of progress across the different components of the master plan. The review highlights two high-level areas where the master plan implementation fell short: a) the master plan was only reviewed twice, once in 2014 and again in 2018 rather than every six months as originally envisioned; b) the responsibilities for different tasks in the master plan had yet to be reassigned following the restructuring of the ministries. The infrequency of the review and lay in reassignments suggests that there are either capacity constraints or coordination issues that plague the government’s implementation efforts. A high-level takeaway of the review is that progress has been more rapid at the secondary school level than at the primary level.

The government is currently considering the National Blended Education Master Plan (2022-2041), an overarching strategy for integrating ICT into education, developed by government working groups in partnership with other development agencies. Before executing the plan, it is essential to grasp what the bottlenecks have been to more effective ICT deployment to date. These constraints are the subject of some of the discussions in this report.

Report Overview

This report is organized by different themes or domains of the education system, each of which is covered by a separate chapter.

In this chapter, we review the government’s policy initiatives and programming that has championed the use of ICT4E.

Chapter 2 describes the challenge students face as they return to school after pandemic induced school closures. We share projections for the magnitude of student learning loss and the need for better and faster approaches to address this – including ways in which ICT based solutions can be leveraged.

Chapter 3 covers the physical and digital infrastructure that exists for information and communication technologies in education and key recommendations.

Chapter 4 describes progress that government and other stakeholders have made in digital content and learning management systems, challenges and suggestions for the way forward.

Chapter 5 discusses issues related to equity and inclusion that arise from the use of ICT in education. We highlight initiatives that aim to bridge digital divides and reach the most marginalized.

Chapter 6 provides an overview of what we know about teachers’ abilities and skills in the area of ICT4E. After describing the current state of teachers’ digital skills in Bangladesh, this chapter shares insights from

recent stakeholder initiatives in this domain. Finally, we outline gaps in teachers' digital skills that government and other education stakeholders can address through concerted action.

Chapter 7 discusses other ICT4E use cases in the area of education system administration and management that could benefit from upgraded technology. We cover the Education Management Information System (EMIS), procurement and learning assessment systems.

We conclude in **Chapter 8** by summarizing key recommendations, how the government can improve the use of ICT in the basic education sector especially in the short and medium term, and scope for further research to explore the landscape of ICT supported education service delivery in Bangladesh and its potential.

Methodology

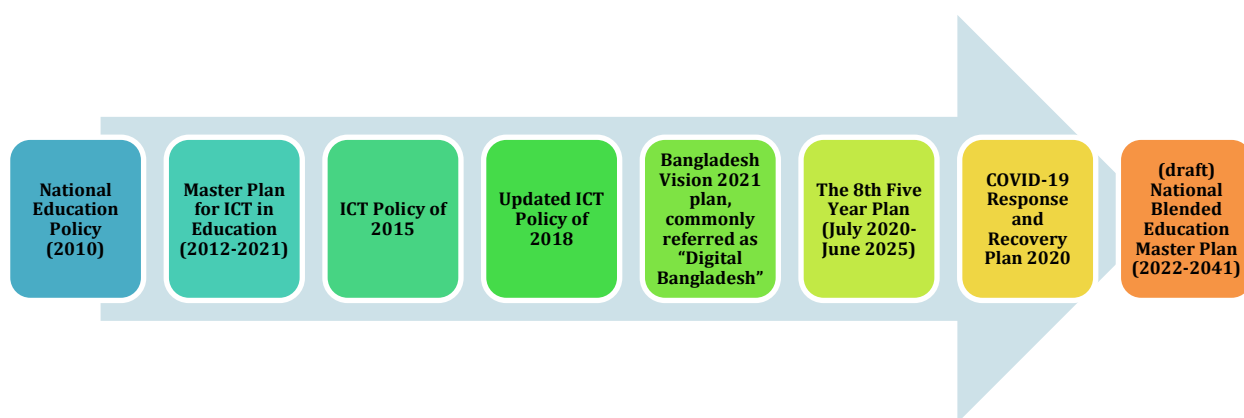
The study draws on two main sources of information: a) a desk review of literature, policy documents, and reports related to ICT4E in Bangladesh; b) interviews with key informants in Bangladesh's education sector.

The study team read and analyzed academic literature and independent agency reports on ICT4E in Bangladesh. To understand the government's objectives, thinking, and actions around the use of ICT4E, the study team read through official policies promulgated over the past 10-15 years. We supplemented this information on official policy by speaking to government officials tasked with overseeing and implementing ICT4E initiatives in Bangladesh. We spoke to representatives from the following government agencies: Aspire to Innovate (a2i), Ministry of Primary and Mass Education (MoPME), The Directorate of Secondary and Higher Education (DSHE), the National Curriculum and Textbook Board (NCTB). The key informant interviews helped the study team understand the real-world constraints and challenges associated with implementing policy directives. We also spoke with representatives from multilateral institutions (UNICEF, World Bank), donor agencies (FCDO, USAID, JICA), think tanks and civil society organizations/non-governmental organizations active in the education sector to obtain a more comprehensive view of the ecosystem. We focused on officials and representatives work on primary and secondary education in Bangladesh. We collected a variety of experts' views on how the system could improve education sector outcomes through the use of ICT4E and what the government's top priorities should be over the short to medium-term. The abbreviated questionnaire used for most interviews is attached as Annex 1.

Background: Bangladesh’s Basic Education Sector and EdTech Policy

In this section, we describe the policy initiatives the government has embraced before explaining how these initiatives are embedded into or reflected in basic education sector programming.

Figure 1.A: Chronological Mapping of Key Policies/Plans with Focus Areas on ICT4E



Policy Directives

Over the past 20 years, the Government of Bangladesh (GoB) has taken numerous steps to promote the use of ICT in the education sector as part of an overarching plan to digitize basic services. An agency dedicated to digital services, Aspire to Innovate (A2I), was established in the Prime Minister’s Office in 2007 with the support of the United Nations Development Programme (UNDP). In 2010, the country launched Bangladesh Vision 2021 plan, commonly referred as “Digital Bangladesh”, with the goal of making high-quality digital services accessible to the population. Following the announcement of Digital Bangladesh, the government introduced a number of policies and programs aimed at increasing adoption of ICT in education. In particular: the National Education Policy (2010), the Master Plan for ICT in Education (2012-2021), and the ICT Policy of 2015. More recently, in 2018, the government approved an updated overarching ICT Policy, which discusses its technology-related objectives in the education sector. Starting in 2021, the government established a number of working groups to deliberate and formulate an overarching national strategy for blended learning.

The 8th Five Year Plan (July 2020-June 2025)¹ commits to boosting ICT in education through the expansion of ICT education and training and eliminating regulatory barriers. This plan also commits to increase budgetary allocations to the education sector to ensure greater access to ICT solutions in education service

¹ The current National Level Economic Development Plan of Bangladesh.

delivery, specifically focusing on lagging districts of the country. Some of the specific strategies of this plan includes – (i) developing a Digital Learning Ecosystem by equipping each institution with all required digital infrastructure facilities through public-private-partnership; (ii) developing a centralized educational resource repository for curating all innovative solutions in preparation for future emergencies; and (iii) adopting a framework to ensure that at least one hour of learning in using web-based contents in all primary and secondary schools in school premises are in place.

The COVID-19 Response and Recovery Plan for Education was developed in 2020 under the leadership of the MoPME and MoE and in consultation with the Local Education Group (LEG). To address the unprecedented challenges in the basic education sector and ensure continued learning, the plan conceptualized immediate, medium-term, and long-term actions building on technology based solutions. The interventions envisioned in this plan aim to build on and complement the existing infrastructure and activities of two existing GoB programs in basic education— the Fourth Primary Education Development Program (PEDP4) and the Secondary Education Development Program (SEDP). While these two programs cater to the whole basic education sector of the country, Development Partners (DPs) provided technical assistance (TA) to implement its COVID-19 Plan, focusing on developing and strengthening its remote learning system (RLS), communication and outreach, and system resilience building.

Programming

In addition to establishing policy frameworks, the government has invested in ICT infrastructure for education such as multi-media classrooms, an online portal for teachers, and remote learning platforms. Policymakers have also built ICT components into large-scale education programs such as the Primary Education Development Program (PEDP), Secondary Education Development Program (SEDP), the Accelerating and Strengthening Skills for Economic Transformation (ASSET) project, Secondary Education Sector Investment Program (SESIP), and the Higher Education Acceleration and Transformation (HEAT) project.

Since 1997, Bangladesh has designed and implemented a series of large-scale programs targeted to increasing access to and improving primary education. In line with the National Education Policy 2010, ICT was introduced as a compulsory subject in secondary and higher secondary education. The fourth iteration of the Primary Education Development Program (PEDP4), which includes contributions from five development partners: World Bank, ADB, JICA, EU and UNICEF, provides financial support for primary school initiatives in Bangladesh over a five-year period (Fiscal Year 2018 - Fiscal Year 2023). The program features a number of ICT components. PEDP4 contains subcomponents aimed at bolstering schools' access to ICT devices such as laptops and projectors. For example, the project funds the distribution of 65,000 ICT equipment packages to schools. Under PEDP4, the government implemented ICT training for 20,000 primary school teachers. The ICT elements of the program extend beyond pedagogy and teacher training to systems-level use cases such as a new Education Management Information System (EMIS) and a mobile app for school inspectors. The PEDP4 program has been restructured recently to repurpose resources to integrate COVID-19 responsiveness. A new DLI has been added to ensure the remote learning system is sustained and integrated under the Directorate of Primary Education (DPE).

The Secondary Education Development Program (SEDP) is a five-year (Fiscal Year 2018/2019 - Fiscal Year 2022/23), 17.2 billion dollar government program aimed at improving the access and quality of

secondary education in Bangladesh. The SEDP features many results areas or domains related to ICT for Education. For example, some of the program's objectives include: a) improving teaching and learning in ICT; b) enhancing the use of ICT for pedagogy; c) digitizing the curriculum through the creation of e-modules, and; d) strengthening the EMIS. Under SEDP, government has directly supported the development of digital content for TV and online learning in collaboration with a2i and have successfully piloted virtual teacher training on core subjects. Under the Secondary Education Sector Investment Project (SESIP), an Asian Development Bank-funded program which subcomponents of the SEDP, the government has established 740 ICT learning centers in 64 districts of Bangladesh (Interview with NCTB Official, 2022). In this clustered approach, each ICT center serves as a central node to deliver ICT content to teachers and students in the area. Each ICT center has 40 desktop computers and a set up for two students per computer. The project has also supported training for teachers in ICT catchment areas.

The Bangladesh COVID-19 School Sector Response Project (CSSR), a 15 million dollar project funded by the Global Partnership for Education (GPE), is a recent government operation that supports adoption of ICT for remote learning for both primary and secondary level. The project was designed to ensure learning continuity for students during the COVID-19 school closures during the pandemic. The project, which still features a number of remote learning components, has been subsequently restructured to focus on supporting students returning to school and the learning recovery. A key component of the project is supporting the integration of remote learning within the basic education system. The project aims to: (i) develop and disseminate 3,662 digital learning contents for television; 4,176 digital learning contents for online/websites/mobile; and 1,080 digital learning contents for radio for students from pre-primary to class 10 in selected subjects; (ii) train primary and secondary teachers on remote learning system focusing on their capacity building in digital literacy; and (iii) sustainability plan for the remote learning system to be integrated in the mainstream teaching-learning.

Recently, the Government of Bangladesh is on the stage to approve the National Blended Education Master Plan (2022-2041) which is based on the Blended Education For All framework to combine digital learning with outdoor learning, to mitigate the impact of the pandemic and to ensure and wellbeing of children. This master plan focuses on following five key elements:

1. **Teaching-Learning Practices**, which aim to prepare learners for the future with 21st century problem-solving skills through synchronous and asynchronous interaction.
2. **Educational Content and Resources**, which are accessible, affordable, reusable, interactive and personalized educational content and resources for all
3. **Assessments**, continuous/formative and summative, among which formative assessments are real-time and performance-based through the use of artificial intelligence tools.
4. **Teacher Professional Development**, which is blended, personalized and continuous.
5. **Inclusive Infrastructure**, which includes ensuring open, accessible, and inclusive physical and virtual learning spaces for all, including systems for connectivity, electricity, bandwidth and devices such that learners and teachers have access to these learning spaces.

This plan has objectives to achieve by 2041 for the long term, but also fixes its target to achieve as urgent (2023) short-term (2025) and medium-term (2031). It has also drawn its budgetary framework to provide strategic direction for all education sectors in order to ensure that all key elements and enabling factors of

blended education are considered during planning, implementation and progress monitoring and to generate blended education solutions for all learners through an effective blend of high-tech, low-tech, and no-tech educational modalities with full understanding of the learners' context and needs leaving no one behind.

Overview of government commitments relating to teachers' digital skills

The Government of Bangladesh's Vision 2021 document emphasized the country's aim to realize a transformed digital society. Reaching this aim included a heavy emphasis on developing a workforce that possessed an array of skills, including digital skills. To achieve this vision, the Government of Bangladesh committed to establishing an ICT-driven curriculum in the education sector (Ministry of Education, 2010). One part of this strategy was an emphasis on developing teachers' digital skills.

Table 1 lists the plans, policies, and projects mentioned in this report. This table outlines the policy documents that captured objectives relating to teachers' digital skills both pre-and-post Covid-19, as well as some of the objectives, including training teachers in acquiring digital skills. None of these strategy documents, however, outline the financial commitments made by the Government of Bangladesh in order to meet these objectives.

Table 1. EdTech-related plans, policies, and projects

Plans				
Name	Year	Contents		
National Blended Master Plan	2022-2041	Teaching-learning practices, educational content and resources, assessments, teacher professional development, and inclusive infrastructure		
Education Sector Plan	2020-2025	<ul style="list-style-type: none"> • Improve the ICT capacity development of teachers and teacher trainers • Teachers to share ICT knowledge with colleagues when they return to school • Strengthen Teachers' Portal based on review of Aspire to Innovate's (a2i) Teachers' portal, and plans for e-learning / e-tutorial 		
Master Plan for ICT in Education	2012-2021	<ul style="list-style-type: none"> • Develop professional ICT skills of teachers • Embed ICT materials into teacher training curriculum • Provide in-service teacher training on basic skills in ICT • Develop Distance learning programme to develop professional skills • Provide online course content / modules for teacher training 		
COVID-19 Response and Recovery Plan	2020-2022	<ul style="list-style-type: none"> • Prepare online teacher training on pedagogy, content knowledge and supporting remote online teaching • Train teachers for school reopenings and remote learning assessment • Develop a digital platform which allows for remote teacher professional development 		
Digital Bangladesh & Vision 2021	2008-2021	Digital government, human resource development, IT industry promotion, connecting citizen		
Policies				
Name	Year	Ministry	Contents/Achievements	
National Education Policy	2010	MoE	<ul style="list-style-type: none"> • Encourage teachers to acquire modern materials for teaching • Train teachers at all levels in ICT and the wider use of ICT • Develop ICT infrastructure in teacher training institutions • Recruit teachers who have considerable ICT knowledge and skill 	
National ICT Policy	2009	MoSICT	<ul style="list-style-type: none"> • Encourage teachers to prepare multimedia-based content and learning materials • Provide primary, secondary and tertiary teachers with ICT literacy 	
Natinal ICT Policy	2015	ICT Division, MoPTIT	Social equity; integrity; universal access; education and research; employment generation; strengthening exports; supports to ICTs; healthcare; environment, climate and disaster management; productivity	
Projects				
Name	Year	Ministry	Development Partner	Budget
COVID-19 School Sector Response Project (CSSR)	2021-	MoPME	GPE	USD 15 million
Primary Education Development Program 3 (PEDP3)	2011-2016	MoPME	ADB, World Bank, DFID, EU, AusAid, SIDA, CIDA, JICA, UNICEF, GPE	USD 8.3 billion
Fourth Primary Education Development Program (PEDP4)	2018-2023	MoPME	World Bank, ADB, JICA, EU, UNICEF	USD 18.1 billion
Secondary Education Development Program (SEDP)	2018-2023	MoE	World Bank, ADB, UNICEF, UNESCO, British Council	USD 17.2 billion
Accelerating and Strengthening Skills for Economic Transformation (ASSET) Project	2020-2025	MoE	World Bank	USD 500 million
Secondary Education Sector Investment Program (SESIP)	1999-2013	MoE	ADB, World Bank, KOICA	USD 500 million
Higher Education Acceleration and Transformation (HEAT) project	2021-2026	UGC, MoE	World Bank	USD 509 million
Transforming Secondary Education program (TSER)	2018-2022	MoE	World Bank	USD 510 million
Primary Education Stipend Program (PESP)	2002-	MoPME		2018-2019 BDT1550 crore

Chapter 2: Lessons Learned from the Pandemic and ICT Uses for the Learning Recovery

The COVID-19 crisis greatly accelerated the development and use of education technologies in Bangladesh. During the COVID-19 school closures between March 2020 and September 2021, the government employed a multi-model remote learning strategy in an effort to keep students learning and engaged. Beyond remote learning, government and other education providers leveraged ICT platforms to communicate with parents, facilitate learning between teachers, and to coordinate internal operations. In other words, the pandemic broadened uses of ICT in the education sector. Government officials and their partners exerted great effort to stand up multi-modal response and ensure education continuity. However, most in the sector recognize that the multi-modal response did not attain universal reach and for the segment of the population that was reached, could not completely substitute for in-person instruction. The challenges faced by the sector in the wake of the school closures are immense. After discussing the sizable negative impact the closures are projected to have on student learning, we describe information and communication technologies the Government of Bangladesh and its partners can consider using to mitigate learning loss and safeguard other dimensions of student welfare. We draw heavily on the implementation experience of Bangladesh and other countries during the COVID-19 pandemic.

Student Learning Loss

Although the government responded to the crisis rapidly by adopting remote learning strategies, these modes of instruction cannot replicate the learning gains of in-school instruction. Policymakers and practitioners are rightly concerned with the impact that Bangladesh's extended school closures may have had on student learning. Projections prepared earlier in the pandemic and prior to the 2021 school reopening in Bangladesh reveal the gravity of the situation. Using a model for projecting learning loss developed in Azevedo et al 2021, a study authored by the World Bank simulated learning loss for three different scenarios which ranged from optimistic to pessimistic depending on length of school closures and effectiveness of mitigation measures (Rahman et al 2021). The authors project that children would lose between .5 and .9 years of Learning Adjusted School Years relative to a baseline of 6.0 Learning Adjusted School Years if schools remained closed for 8 to 10 months. Their projections also suggest that the fraction of students who are not proficient in reading at the end of primary school (Grade 5) would increase from 57 percent to 76 percent due to the school closures.² However, the school closures in Bangladesh were extended due to surges associated with the Delta variant and ended up being approximately 9 months longer than the worst-case scenario assumed by researchers. In other words, policymakers can assume the school closure related learning loss is steeper than that projected by Rahman and Sharma.

² This projection assumes that all students learning are equally impacted by the closures.

In analysis prepared in October 2021 following 18 months of school closures, World Bank researchers³ used a time series model (Structured Vector Autoregression)⁴ to simulate learning loss at the secondary school level. Using national assessment data from 2017 and 2019, they model the impacts of the COVID-19 shock on student performance for nine grade-subject combinations: the three secondary school grades (Grade 6, Grade 8 and Grade 10) and three secondary school subjects tested by the national assessment (Bangla, English and Math). They find that the learning recovery in these grades and subjects will take between a minimum of 1-2 years. Below we show the results of the analysis, which assumes a .2 standard deviation shock to student learning, for Grade 8 subjects Bangla, English and Math.

Figure 2.A: Projected Learning Recovery Time for Grade 8 Students in Bangla

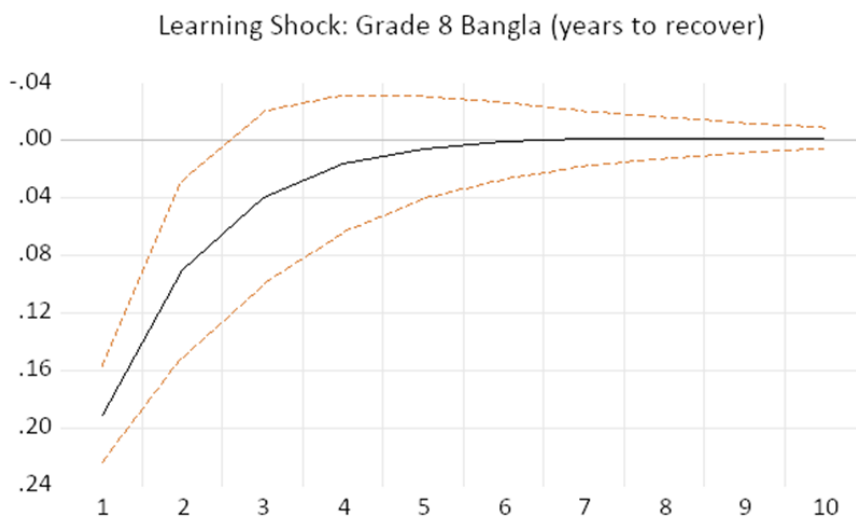


Figure 2.B: Projected Learning Recovery Time for Grade 8 Students in English

³ This learning loss analysis was conducted by World Bank consultant Vatsal Nahata.

⁴ There are three notable limitations to the analysis in this model. Since the model requires the same unit to be tracked over time and different students were sampled in the 2017 and 2019 rounds of the national assessment, the analysis is performed at the district level. We only have two time periods (2017 and 2019) for which we have comparable student test scores for this analysis. Lastly, we only had three covariates in our model and their 2 year lags: learning assessment scores, school location (urban/rural), and institution type (general, madrassah)

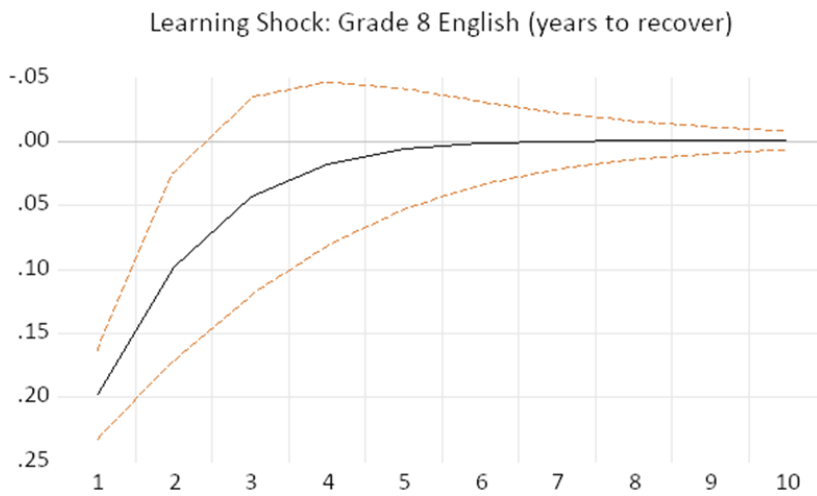
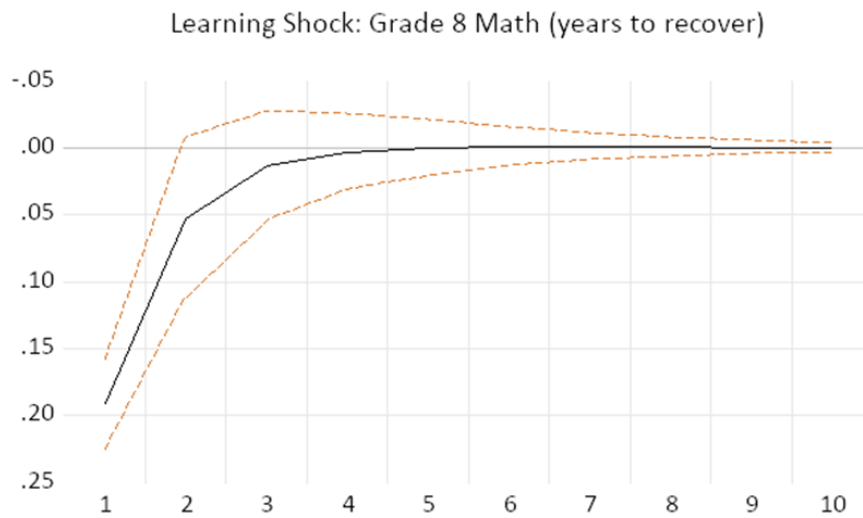


Figure 2.C: Projected Learning Recovery Time for Grade 8 Students in Math



Figures 2.A and 2.B show that it will take at least two years for Grade 8 students to recover Bangla and English learning due to the COVID-19 shock. **Figure 2.C** shows that it will take at least 1.5 years for Grade 8 students to recover Math learning.

Key Recommendations (Based on Promising ICT Approaches for the Learning Recovery)

The steep learning losses projected for primary and secondary students underscore the need for policymakers to identify interventions that can stem learning loss and accelerate the learning recovery. A key risk is that students impacted by the pandemic will not gain the basic skills they need to succeed in life such as basic reading proficiency. While children have returned to in-person instruction, the school system is not sufficiently prepared to address the learning-related challenges they will face. A business as usual approach vis-a-vis curriculum, instruction and assessment risks leaving students behind (especially those who are most marginalized). Government should apply the lessons of the pandemic and find ways that ICT can support the learning recovery. In this section, we highlight some promising ICT-based approaches that deserve further consideration.

1 - Learning Assessment

Government and its partners should pilot using remote, phone-based assessments to track and monitor student learning progress, assess the effectiveness of interventions, and to direct support where it is needed most. Researchers have used remote assessments, a low-cost alternative or complement to in-person assessments, in a variety of contexts to assess student knowledge during the pandemic. For example, researchers Noam Angrist, Peter Bergman and Moitshepi Matsheng used an adapted, phone-based version of the ASER, a widely used test of basic numeracy in the developing world, in Botswana to assess the effectiveness of low-tech phone-based interventions during the pandemic (Angrist et al 2020). After testing whether the assessments measure learning accurately, the co-authors also find evidence that high-frequency phone assessments can be used to help target instruction to the level of individual students. While phone-based assessments hold promise, further research is needed to establish their reliability. For this reason, it would make sense for GoB to consider piloting these assessments in partnership with research organizations that specialize in education measurement.

2 - Adaptive Learning Platforms

Researchers affiliated with Innovations for Poverty Action conducted a study in which they encouraged the take-up of GoB's remote learning programs broadcast on Sangsad TV, internet lessons, and the Robi 10-minute school adaptive learning platform through subsidies and the provision of information to parents (Beam et al 2021). Researchers find some evidence of greater parental demand for "adaptive-style resources" such as Robi 10-minute school and tutoring compared to content that is designed for one learning level. The government should explore ways to boost take-up of personalized learning platforms such as Robi 10-minute school and MindSpark. Piloting the gamified learning platform for Grade 6 and 7 students developed by UNICEF and a2i would be a useful step in this direction. These platforms have the added benefit of being able to certify student learning levels which may prove useful for assessing the state of student learning and for credentialing purposes.

3 - Telementoring/Tutoring

Several studies have found that phone-based teacher support, mentoring, or instruction can help achieve better student learning outcomes. In Bangladesh, a study of a volunteer telementoring program for students and their mothers found significant positive effects on student learning (Hassan et al, 2021). In the program,

designed by researchers, university volunteers provided homeschool support and mentoring to primary school age children and their mothers during sessions each week for 13 weeks. Students who received the program scored .66 standard deviations higher in English and .56 standard deviations higher in numeracy compared to those who did not receive the program. The intervention increased parental involvement and helped those who were academically weaker. Evaluating a low-cost remote learning program in Botswana, researchers found that educational SMS messages (basic numeracy problems sent via SMS) and short phone-based follow-ups on the SMS by a live instructor were very effective at boosting student learning. While a number of remote tutoring or mentoring programs demonstrate a positive impact on learning, others do not find learning gains. For example, researchers at the Center for Global Development found that one-on-one phone tutorials by teachers in Sierra Leone did not result in student learning gains (Crawford et al, 2021).

4 - Enrollment Tracking/Encouragement

A key concern for the government is that students will drop out of school due to economic hardship experienced by their families during the pandemic. The government could explore the use of SMS reminders or other ICT-based outreach methods to stay connected with parents and students - and encourage them to return to school. In Bangladesh, UNICEF has used feature phones to contact students at risk of dropout with some success.

Chapter 3: Digital Infrastructure

This chapter focuses on digital infrastructure. The definition of digital infrastructure in this chapter covers (1) availability, penetration, and affordability of digital devices (laptop, television, and mobile phones) and (2) digital connectivity for accessing EdTech (electricity and the Internet).

Cost and Availability of Devices that can be used for EdTech

International development lessons before the COVID-19 pandemic have positioned devices as later on the priority list, coming after infrastructure, systems, and capacity building. However, as noted in the comment below, during the COVID-19 pandemic, digital devices were not supplements but essential to continuing education.

*In a survey, we found that only 52% of households had a TV. This means that even Sangsad TV broadcasted, around 48% don't have access to TV. Smartphone is less than 35%. This means 65% can't access any online class. So, device is the issue. Even 35% of students who have smartphones, those are parents' devices. It is very difficult to have remote learning when parents go outside for work. Even students have a smartphone, a 20 minute online class costs a lot of mobile charge—
Development Agency Staff Member.*

Access to technology has become an essential part of continuing education during/after COVID-19 pandemic. **Table 2** shows the individual and household penetration of some basic digital indicators in Bangladesh (ITU, 2021; Jahan et al., 2019). While expanding access to technology alone is not sufficient

to improve learning, it is a necessary first step for some other types of interventions (Rodriguez-Segura, 2021).

Table 2: Access to Technology in Bangladesh (ITU, 2021; Jahan et al., 2019)

Item	Percentage of households with					
	Mobile phone		Computer		Radio	TV
Area	All	Rural	All	Rural	All	All
Percentage	107.1	92.0	5.6	2.0	0.6	50.6

Laptops

As for the laptop market in Bangladesh, it has been growing rapidly at 15%-20% annual growth, and more than a million laptops are imported every year (Haque, 2021). Compared to the growth of the laptop market, however, laptop penetration for education purposes is still low. According to household survey data, household penetration of computers is only 5.6% in Bangladesh, and in rural areas, it is only 2% (ITU, 2021; Jahan et al., 2019). As a result, most students, , use their parents' mobile phones to access online content. An exception is university students. According to the survey for university students conducted by UGC, only 10% of respondents did not own their own computers or laptops (Priyo & Hazra, 2021).

For teachers, to create digital content and conduct online classes, not only device distribution to schools but also device distribution to each teacher is necessary. In the interviews with Bangladesh government officials, several interviewees mentioned the dissemination of devices to teachers as the main challenge. During the school closures due to COVID-19 in South Asia, several teachers reported that they used their private laptops or mobile subscriptions to conduct online classes. Therefore, the dissemination of education devices for teachers and schools is desired for the continuation of digital learning.

Mobile Phones

Mobile phone subscriptions in Bangladesh are rising rapidly, from 46 percent in 2010 to 107 percent in 2020 (ITU, 2021). It should be noted, however, that more than 100 percent does not mean that everyone owns a mobile phone, as many people own several mobile phones. Among mobile phones, smartphones have been spread, and more than 32% of citizens own smartphones (Newzoo, 2020). However, smartphones are still expensive for many citizens (Haque, 2021).

Furthermore, high penetration of mobile devices does not directly imply having devices available for education. For many children, the majority of them had to use their parents' devices to access education during the school closures. A government officer pointed out the challenge, “*We are trying our best. We*

will facilitate Wifi to all schools. But for children at home, it is difficult to deliver digital content. When guardians go outside for work, children can't use the device.”

The gender gap in mobile phone use in Bangladesh has also been observed in GSMA (2020). The report shows that (1) Bangladesh is listed as one of the most difficult countries where women can obtain permission to use mobile phones from their families, and (2) the gender gap in the percentage of mobile internet users between men and women is 52%.

Access to mobile devices is expected to be a priority issue for preparing upcoming blended learning strategies by many government officers' interviewees. For example, a government officer claimed that they will emphasize supplying ICT tools, such as smartphones and Wifi connections, to teachers and students in each school. Interviewees from development agencies recognize the gap and potential of mobile devices.

*52% of students couldn't access remote learning. That was a big gap but mobile penetration is 98%. Actually, many teachers called students individually but it was not structured. Since more than 89% teachers use mobile phones, there is huge potential for using EdTech for teachers.—
Development Agency Staff Member.*

Television (TV)

When schools were closed due to the COVID-19 pandemic, the main source of education continuation was TV broadcasting, mainly by Sangsad TV because of TV's high penetration compared to other media. As of 2020, 50.8% of households own a TV (ITU, 2021).

On the other hand, although TV penetration is high compared to other media, it covers only a half of households. This means that here is no single technology that covers the entire population in Bangladesh. Therefore, in the interviews with government officials, they agreed it is necessary to reach marginalized people who do not have access to even low-tech media such as TV and radio.

Although TV programs were the main option for continuing education on a national scale at the beginning of the pandemic, there were many challenges in terms of whether they were effective and sustainable as an educational method. BIGD & PPRC (2022) claims that students spent significantly less time for remote learning during school closure; only a quarter of students with access to TV reported watching TV-based classes and more than a third of students who participated in TV-based classes found them difficult to follow. In addition, research on the effectiveness of TV programs also asserts that few are watching government- provided educational TV lessons, online videos, or using other online tools after one year (Beam et al., 2021). As the main reason for low viewership, the study emphasizes the importance of establishing connection and interaction with educators even virtually such as through telephone calls. While a strong desire exists among students and parents for learning continuation during school closures, the most effective way was to establish a connection with the teachers, and it was difficult to obtain the learning outcome through one-way digital learning alone (Beam et al., 2021).

Connectivity/Power/Electricity

To access EdTech content, electrical and telecommunications infrastructure, namely electricity and the Internet are necessary in addition to digital devices. A development agency staff emphasized the importance of accessibility because using digital technology was the only option for students to prevent learning and give them opportunities during a pandemic. A government officer also asserted the necessity of developing digital infrastructure when asked about new projects he would take like to see materialize.

If we get funding for a project, we are very much eager to develop infrastructure. Along with this, we need to conduct a pilot program regarding aiming to ensure students' learning using technology. Through continuous assessment, we can assess how technology will be grateful. We have already conducted a pilot on a smaller scale. If we get funds, we will try 30,000 schools and 4 lak teachers in Bangladesh.—Government officer

Electricity

Access to electricity in Bangladesh is increasing rapidly, from 52% in 2010 to over 90% in 2021 (World Bank, 2021b). On the other hand, compared to the high electricity penetration to households, low penetration in schools is still a challenge. According to Haque (2021), while more than 99% of households are supplied with electricity, more than 10% of primary schools—mostly connected to frail and overburdened urban grids or located in hard-to-reach areas—still do not have access to electricity. Since both infrastructure and price hamper the access to electricity to schools, the report recommends that electricity should be provided to primary and secondary schools at an affordable price.

Internet Access

There are large regional disparities in Internet access. For example, 55% of users in rural areas have access to the Internet, compared to only 35% in rural areas (Alliance for Affordable Internet & a2i Programme, 2019). Interviewees who are government officials said, “*Obviously ICT is the most powerful but we are not prepared to go through this medium because it will have some discrimination for the marginalized people.*” These officials emphasized actions to give access to the internet for those people.

Access to the internet is essential to the use of high-tech learning resources. There is a clear digital divide between households with and without internet, and with and without broadband. Mobile broadband is growing in Bangladesh at 60% in 2021, while fixed-line broadband is limited in only 0.8% of households (World Bank, 2021). This means that most broadband access in Bangladesh is by mobile phones which has relatively slower speed and more expensive than the fixed broadband (Hossan, 2022). An online internet testing site shows that the average mobile internet speed in Bangladesh was 15.24 Mbps, which ranks 129th among 142 countries, and the average fixed broadband speed was 48.05 Mbps, which ranks 98th among 182 countries (Ookla, 2022). Limited internet bandwidth is one of the reasons for the slow internet speed. Although internet bandwidth may run out by 2023 due to the increase of internet usage (25% increased after the COVID-19 pandemic), additional submarine cable will not be available until 2024 (Irani, 2021).

In addition to internet access, the cost burden is also an issue. In order to access educational content, mobile packets must be purchased. Although the mobile data cost in Bangladesh was cheaper than most countries,

which ranks 18th cheapest country in the world (GSMA, 2019), many families were unable to access content due to the high cost of the internet. For example, in Bhutan, the government and telephone companies made an alliance to ensure internet access for educational purposes during a pandemic by subsidizing the cost of accessing educational content.

Key Recommendations

Availability of digital devices with internet access for learning is necessary. For teachers, to create digital content and conduct online classes, not only device distribution to schools, but also device distribution to each teacher is necessary. In the interviews with Bangladesh government officials, several interviewees mentioned the dissemination of devices to teachers as a main challenge for implementation of blended learning. In addition, it is observed that users of distributed devices face technical challenges due to not having the proper maintenance and IT assistance support, government can provide a proper mechanism for technical support in collaboration with other agencies or private sector.

Students need digital devices for accessing blended learning and digital content created by the Government. Even TV, the most pervasive media, has a penetration rate of only around 50%. Smartphones have a penetration rate of about 35%, and about 65% do not have access to online content. This indicates the difficulty of delivering educational content from the government to all the students. In order to efficiently deliver government content to students and promote blended learning, it is important to create an environment in which students can access digital devices. This ASA could suggest technical assessment for affordable and accessible devices for students or education hub at the remotest part to ensure students participation in blended learning.

Access to the Internet for students is critical. Even households with digital devices, such as mobile phones and laptops, the cost of internet access is another burden for most households. Providing subsidy or free access to education content with the collaboration between Government and private mobile companies should be considered. Some of the global initiatives could be also explored who works to craft compelling investment cases for blended public private funding to build the connectivity infrastructure needed to deploy digital learning solutions and other services.

Chapter 4: Digital Learning Systems (digital content, LMS, adaptive learning)

A digital learning system is one where a students' interaction with content is mediated through technology. In this section, we discuss how traditional learning materials are being digitized or converted into ICT-based platforms - or alternatively, designed exclusively for those platforms. We also touch on a category of platforms that are particularly promising.

Digital Content and Learning Management System (LMS)

In order for ICT initiatives to generate positive impacts on learning and other education outcomes, they need to deliver quality content through platforms that students and teachers can readily access. In this section, we share the most widely used digital platforms in the ICT4E space in Bangladesh and describe the steps the government has taken to digitize education content including efforts to convert curriculum content into digital formats. Overall, our interviews with stakeholders suggest that the COVID-19 crisis led to a massive acceleration in content development, deployment and use, although large-scale efforts to digitize curriculum have been slower. We also discuss the potential of adaptive learning to boost learning and student engagement.

Government efforts to create and disseminate curriculum-linked digital content have taken several different forms: a) providing digital copies of teaching and learning materials by publicly posting PDFs; b) creating interactive material linked to items/questions in textbooks; c) creating learning materials that are curriculum referenced or grade level-appropriate for online, TV or radio-based distribution. The country's national curriculum textbook board (NCTB) is also in the process of digitizing teaching and learning materials for the secondary school curriculum.

NCTB spearheaded the first initiative to digitize teaching and learning materials in 2017. In this initiative, implemented as part of the Secondary Education Sector Investment Project (SESIP), NCTB embedded interactive content in secondary school textbooks. The interactive content was hyperlinked to specific items/questions/words such that students could click on hyperlinked text and access audio/video content related to the lesson. The interactive content included: the meaning for hyperlinked words, animations, simulations, and other audio/video content. For example, words with a complex meaning might be hyperlinked with a more in-depth definition of the word. The scale of this initiative was extremely limited: only 16 pieces of interactive content were released in textbooks for one grade (Grade 6). While data on take-up is not readily available, a key stakeholder at NCTB noted that a relatively small fraction of students accessed the content. The stakeholder we interviewed attributed low-take up to the education system's focus on high-stakes exams and students' reluctance to learn content not relevant for the exam. (Interview with NCTB Official, 2022). Since the content was produced, some in the agency expressed concerns about integrating the interactive content with the Learning Management System (Shikhok Bhatiyon), given that take-up is so closely related to students' ability to access the internet. The fear was that integrating with the LMS would constitute a form of digital discrimination against students without access (who tend to be from families with fewer resources).

The government and other stakeholders' efforts to digitize curriculum content have expanded considerably in recent years. Government is collaborating with the Sheikh Russell Lab and UNICEF to digitize digital content. UNICEF is planning to develop 9,000 pieces of digital content. The international agency has helped support the government in its efforts to adopt education technology by providing technical assistance and by catalyzing the development of several ICT platforms. For example, in recent years, UNICEF worked closely with a2i to develop a gamified learning platform for Grades 6-7. The basic idea is that students would be able to take a "course" on this gamified interactive platform that would gauge or demonstrate their curriculum-appropriate competencies. Students could then receive a certificate that verifies their competency in grade-level skills. The appeal of this system is that it is integrated with formal learning

standards in the curriculum. The pilot of the platform was scheduled for 2020 but was postponed on account of the pandemic and official government permissions. The government is in the process of rolling out a competence-based curriculum for secondary education in a phase approach. The official we spoke with at the national curriculum board indicated that they are interested in digitizing teaching and learning materials for the new curriculum, although exact timelines for implementation are unclear.

Adaptive Learning Platforms

While the government was able to distribute remote learning content during the pandemic via technology platforms, much of the content was pre-recorded and did not allow for interaction between the learner and instructor. Two major takeaways from Bangladesh's remote learning experience during COVID-19 are that: a) students are more interested in interactive content than with static or pre-recorded content; b) students benefit from content that is appropriately paced and at the right level. Stakeholders involved in the government's COVID-19 response cited the lack of interaction as a key barrier to the adoption of remote learning technologies. Policymakers should leverage the potential of adaptive technology platforms, which provide customized instruction and interaction, to improve student learning.

In a recent review of education technology interventions, the author found that those aimed at improving pedagogy and instruction were among the most effective at boosting student learning (Rodriguez-Segura, 2021). For example, researchers examined the impact of an adaptive technology-based learning software called MindSpark in India and found impressive learning gains after just 4.5 months (Muralidharan et al 2019). MindSpark is a learning platform that shows students high-quality content and items based on their level. While MindSpark's software can be deployed on a variety of platforms and in different settings, researchers evaluated an after school intervention in which students engaged in 45 minutes of self-driven learning using MindSpark and 45-minute small group sessions facilitated by a teaching assistant for six days a week. The main value of this software is that it customizes learning and delivers high-quality instructional content tailored to the level of the student. Researchers demonstrate that many of the students in the sample were behind grade level prior to the intervention. Software such as MindSpark could have the potential to help students build basic competencies and catch-up to grade level.

Evidence from Bangladesh's recent remote learning experience suggests that parents and students value personalized instruction and that adaptive learning platforms could help meet some of these needs. A variety of studies show that students engaged with private tutors during the school closures. In fact, other than self-study of materials, this was one of the main ways that students continued learning during the pandemic. Other personalized instruction modes can help students learn more such as private tutoring, which are widely used by parents and students.

Chapter 5: Equity Dimensions for ICT Use

We have reviewed macro information on digital learning platforms and infrastructure such as devices and the Internet. While these services and infrastructure are built for the country as a whole, not everyone benefits equitably. This chapter describes the equity dimensions for ICT use, including geographic differences, differences in digital literacy at the individual/household level, differences by gender, and the approaches public authorities have taken to the COVID-19 pandemic for these vulnerable groups.

5.1: Equitable Use of ICT4E

5.1.1 Rural Areas

EdTech in rural areas is disadvantaged from multiple perspectives compared to urban areas. And the gap is even larger during the pandemic. For example, a government officer said, *“There is a divide between rich and poor and rural and urban. City-based rich families actually didn't lose much. Their children immediately shifted to digital learning.”*

Therefore, support for remote areas will be very important in terms of inclusiveness, but multiple types of support will be needed. A government officer recognizes the issue as follows:

In underprivileged areas, the main hurdle is a lack of infrastructure. Lack of devices for both teachers and students. Capacity building of teachers is also required. We have challenges in accessibility and digital divide.—Government officer

As for teacher's support during school closure, there were some reported cases of social media-based support, such as Facebook, but mainly happened in the city area. For example, a government officer explained the digital divide on social media between urban and rural areas:

In urban cities, many teachers use Google Classroom. But, as a whole country, only 5% of teachers use Google Classroom. The next platform is Zoom, with 43% of teachers. Google Meet is also used. Considering technology during COVID, Facebook played a great role in teaching activity.—Government officer

A civil society organization official claimed strong passion for inclusive education. *“The government's role is to ensure equity, looking after the most marginalized people to ‘no one left behind.’ All the systems should focus on who is left behind. Accordingly, I told that we should focus on young teachers because they are front-line. But all teachers should have minimum proficiency in ICT.”*

Teachers in rural areas were also more burdened during the pandemic than those in urban areas. For example, the interviewee from the Ministry of Education mentioned the challenges, *“What our teachers in remote during COVID did was that they visited students' home to distribute worksheet (paper material). They also collect the materials after a few days. This happens especially in remote (village) areas. These challenges, low connection, non-availability of smartphones.”*

It should be noted, however, that in many cases, accessible technology cannot be inferred from income level alone. For example, households without access to television or radio do not necessarily have the only option of paper-based solutions; the MoE has reported cases where educational support was provided on Facebook via mobile phones even households without television or radio, “Actually TV is not available for all of them, especially in villages. But we notice that Facebook is a common media in Bangladesh to reach most of them.”

5.1.2 ICT Literacy

While knowledge of hardware and software is important, ICT literacy on how to use technology in daily life and education is also an important component of EdTech utilization. ICT literacy is not only important for students but also for parents who provide educational opportunities for their children. For example, a government official mentioned the importance of parents’ support:

*We have started TV programs on Sangsad TV, and there are schools/colleges conducting online classes, but the attendance was not very good. There were many reasons: TV is available almost everywhere, but family members need to support students and tell them “watch the show.” Families are watching other programs (drama). Students are children, and we cannot expect that they can follow a TV class. Even the online classes, students are logging in and doing something else.”—
Government officer*

On the other hand, ICT literacy in rural areas is a hurdle to utilize digital technology in rural areas. Jahan et al. (2019) conducted a survey of 6500 households in rural Bangladesh on their access to technology as digital literacy and their ability to use technology to solve problems. The results of the study showed that the Digital Literacy Index (DLI), which measures only elementary-level indicators, shows that more than half of the households were below 0.25 on the DLI and only two of 6500 households recorded 1.0 (Jahan et al., 2019).

In addition, ICT literacy on how to safely live in an ICT-based society is important. NTCB already has a dedicated subject of digital literacy (out of 10 subjects) for every secondary school student. The government wants to teach these students how to use the Internet safely and not be influenced negatively.

The importance of ICT literacy is also not limited to students and parents. There are large differences in ICT literacy among educators, with older teachers more likely to have trouble adapting to EdTech, and younger teachers more quickly adapting to EdTech. The ICT ambassador is expected to be the leader of ICT implementation in each region (union). ICT ambassadors are teachers in primary and secondary education in both government and non-government schools who are willing to volunteer to engage with ICT hubs. A government officer expected the ICT ambassadors to take a leading role in EdTech as follows, “Some of them really did a good job, particularly on access to technology, but others didn’t perform well. They show both satisfaction and frustration.”

5.1.3 Gender

There are several digital gender gaps reported in previous articles. GSMA (2020) reports that the gender gap in the rate of mobile owners is 29% and the gap in mobile internet users is 52%. The report also shows that Bangladesh and Pakistan are listed as countries where women have the most difficulty obtaining permission from their families to use mobile phones.

Social norms constitute another hurdle that generates gender gaps. A case study in rural Bangladesh asserts that social fear and norms in rural areas prevent women's access to technology (BIGD, 2022). For example, some adults prohibit unmarried and schoolgirls from using mobile phones even if their brothers use them. These adults believe that prohibiting access to mobile phones can prevent their daughters from engaging in socially unacceptable activities, such as conversations with outsiders. Imparting the importance of digital devices as educational tools to adults with low ICT literacy or traditional social norms is necessary to fill these gender gaps in education.

On the other hand, girls are not always at a disadvantage over boys. According to Redfern & Ahsan (2022), the government pays a stipend to girls in secondary school students to give families an incentive to attend school and prevent child marriage. This difference in stipend for boys induced cases in which tens of thousands of boys dropped out of school during the COVID-19 pandemic to compensate for the loss of family income due to the pandemic (Redfern & Ahsan, 2022).

5.2 Actions for Disadvantaged Students

5.2.1 Students with disabilities

Bangladesh is committed to disability-inclusive education, and the Accessible Reading Materials (ARM) initiative has led activities to continue education for the students with disabilities during the covid-19 pandemic (UNESCO, 2021). According to the report, the pandemic caused many students to be concerned about access to education, especially for students with disabilities, as expressed in the following statement: *"When school closed, I returned home without carrying a single printed Braille book because the books are too large to carry and I did not think that school will remain closed for this long."* To facilitate access to education for students with disabilities, the government has prepared multimedia content with development partners, as well as provided access to thousands of assistive devices, such as smartphones, laptops, and book readers. On the other hand, several technical challenges have been identified in implementing EdTech to support students with disability (UNESCO, 2021). First, there is a lack of high-quality text-to-speech software in the Bengali language. The lack of Unicode text is also an obstacle to making paper and digital texts accessible.

5.2.2 Student Allowance Program

During the COVID-19 pandemic, poor families have been unable to pay tuition due to a decrease in family income. In order to continue education for these families, the World Bank-financed secondary education program provided stipends and tuition fees to 2.5 million secondary students, which consist of 0.9 million boys and 1.6 million girls (World Bank, 2021a).

In addition, the Primary Education Stipend Program (PESP), which has been operating since 2001 as a stipend providing program for elementary school students, has started shifting from cash to digital money since 2017. While this is not an EdTech example of educational content, it is an example of the use of technology in education in terms of speed and certainty of money transfers (Gelb et al., 2019).

5.2.3 Out of School Youth

During school closure due to the COVID-19 pandemic, students' dropouts increased. The majority of students who dropped out could not attend school due to (1) lack of media and (2) forced work to help family income that decreased during the pandemic (Redfern & Ahsan, 2022). In the past, BRAC's Bridge Schools project and other projects have been implemented to re-educate children in order to pick up students who dropped out due to a lack of understanding of the lessons (Touhid, 2021). On the other hand, during the school closures, connecting students and teachers was effective in preventing dropouts. For example, a development agency officer introduced an intervention that prevents dropouts through telephone call interactions between teachers and students as follows:

We utilize feature phones to connect students at risk of dropout. We found more than 98% of students came back to school after the school closure due to the pandemic. But in other areas where this kind of support can't be obtained, the dropout rate was still high.—Development agency staff

Key Recommendations

A rapid assessment of grade level preparedness of students is needed to place students in an appropriate recovery phase rather than using one approach for all. Looking ahead to operating schools with some possibility of living with COVID indefinitely, the MoE will need to emphasize on unlocking the digital potential and making the blended approach to integrating the distance mode into regular teaching-learning.

Parental awareness and role of community will be important factors for successful implementation of government's blended learning master plan and recovery strategy. According to a joint survey conducted by PPRC and BRAC Institute for Governance and Development (BIGD 2022), there is evidence that indicates a relationship between socioeconomic disparities and the learning loss crisis. For instance, there is a direct relationship between mother's education level and children's learning loss risk. Furthermore, the same survey also found that 44% and 36% rural and urban slum households respectively did not have any access to electronic devices for online learning. Awareness program on learning recovery targeting parents, associated community members could be initiated in collaboration with government agencies and private sectors.

Innovative financing mechanism to reduce digital divide. Ministry of Education can consider earmarked grants to school for purchase of devices, internet cost and financing training of teachers. The current poverty targeted stipend scheme can be revisited to add a top up amount for students belonging from the rural and marginalized population, to mainly compensate for the internet connectivity cost.

Chapter 6: Teachers' Digital Skills

Why are Teachers' Digital Skills Important?

Teachers play a critical role in addressing the global learning crisis. According to the Teachers Taskforce,⁵ “*teacher quality is the most important determinant of learning outcomes at school level, but in many countries teachers are in short supply, isolated and not supported to provide effective teaching and learning*” (Education Commission, 2019). A teacher’s ability to deliver high-quality learning experiences for students can potentially be enhanced through strengthening their digital skills. This can be achieved in several ways (Evans, 2021). Firstly, technology can be a medium through which to train, coach and mentor teachers. In Rwanda, for example, 5,000 English language and mathematics teachers have been targeted through a mobile-enabled platform to allow for their continued professional development (CPD) (Education Development Trust, 2021). Secondly, technology can be a means of aiding teachers to strengthen their content knowledge and pedagogical skills. Teachers can use internet sources to help support themselves in developing lesson plans or to source appropriate content (Hennessy et al., 2021). In Bangladesh, one study found that providing teachers with training on technology and learner-centred pedagogical approaches through the use of technology in rural areas led to improved test scores for students (Cristol et al., 2019). Thirdly, technology can help create virtual communities of practice between teachers. In Kenya, for example, Facebook groups proved an effective medium through which teachers could ask other fellow teachers content-related questions (Bett & Makewa, 2020).

COVID-19 Pandemic and Teachers Digital Skills

During the Covid-19 pandemic, teachers and students globally were forced to rapidly transition to remote learning. More than 60 million teachers around the world needed to quickly adjust their practices to support close to 1.5 billion students affected by school closures. In Bangladesh, like many other countries, teachers were unprepared for this rapid shift, with many lacking the digital skills needed to effectively deliver remote learning. The Government of Bangladesh tried to mitigate this challenge in a number of ways. One such solution was to deliver online teacher training programmes, which not only helped practising teachers to develop digital skills but also helped maintain continuity in pre-service training for soon-to-be graduate teachers (UNICEF & UNESCO, 2021). For teachers already in the teaching profession, the Muktopaath and Teachers’ Portal were useful government programmes specific to teachers’ digital skills. The Muktopaath programme provided teachers with online courses and live classes, while the Teachers’ Portal was a repository of online content uploaded by teachers themselves, of which some related to digital skills. Aside from government programmes, there are a number of initiatives from non-governmental organisations, which have extended digital training programmes to government school teachers. These include Alokito Teachers, BRAC and Light of Hope.

The initiatives rolled out in response to the pandemic not only mitigated the short-term challenges but will also provide a foundation for strengthening Bangladeshi teachers’ digital skills in the years to come. Teachers’ digital skills are likely to become increasingly prioritized by governments — both in Bangladesh

⁵ The Teachers’ Taskforce is a global partnership forged in 2008, which is dedicated to raising awareness and helping in supporting countries to achieve SDG target 4.c, which is about increasing the supply of qualified trained teachers. More information on the Teachers’ Taskforce can be found [here](#).

specifically and around the globe — as technology becomes increasingly more prevalent in daily life and more integrated into education provision. In Bangladesh specifically, a good example of this is the 2020 Covid-19 School Sector Response Project. This project is looking to mainstream the use of technology as a way to facilitate remote learning, which will help build education system resilience to react to and recover from future shocks (World Bank, 2020). As part of this, the Government of Bangladesh is currently developing its National Blended Education Masterplan, which it will roll out in 2022.

Teachers’ digital skills are central to these education strategies that the Government of Bangladesh has proposed going forward. This chapter positions what the current state of teachers’ digital skills is, what government programmes are in place relating to teachers’ digital skills and what the gaps are. The chapter is organised as follows. **Section 1** provides a situational analysis of what we know about teachers’ digital skills in the context of Bangladesh. We look at the specifics of teachers’ access to digital devices and digital learning opportunities. **Section 2** presents what we know about government programs aimed at developing teachers’ digital skills in Bangladesh. **Section 3** identifies gaps in the current set of government programs focused on developing teachers’ digital skills. Finally, **Section 5** concludes with recommendations that highlight short- and medium-term opportunities for strengthening teachers’ digital skills in Bangladesh.

A Working Definition of Digital Skills

There are many different definitions of what constitutes teachers’ digital skills, with the term itself being used interchangeably with such terms as “teacher’s ICT competence”, “digital competence”, “digital literacy”, “pedagogical digital skills.” However, central to all these is the idea that teachers should be able to attain, use and apply digital technologies and integrate them into their teaching practices (Perifanou et al., 2021). For the purposes of this report, digital skills are defined as “*a spectrum of skills that facilitate the use of digital devices, communication applications, and networks to access information and better manage it*” (UNESCO, 2018).

Section 1: The current state of teachers’ digital skills in Bangladesh

2.1 What do we know about teachers’ digital skills in Bangladesh?

A significant challenge in trying to understand the current state of teachers’ digital skills in Bangladesh is a lack of primary, empirical, data. While we were able to identify a small number of data sources, further research is needed to better understand the current status of teachers’ digital skills in Bangladesh.

In the absence of such data, for this chapter, we have instead utilized a number of different sources to generate insights into what we know about teachers’ digital skills in Bangladesh. While obtaining comprehensive data relating to teachers’ digital skills presents a challenge, the information that has been sourced does present some emergent patterns of interest. By weaving together information from these various sources, we are able to provide some level of insight into the current status of teachers’ digital skills in Bangladesh (Haque, 2021; Khan et al., 2021; T4, 2021).

2.1.1 Many teachers do not have access to the tools that are necessary to improve their digital skills

Multiple surveys have revealed that the development of teachers' digital skills is likely to be restricted by a lack of access to relevant digital equipment. A 2021 survey by the Asian Development Bank found that during the Covid-related school closures, 50% of teachers in Bangladesh had to use their own mobile data packages to access the internet to deliver teaching. Just 12% of teachers had a community access point for internet connectivity (Haque, 2021). Nearly half of the teachers from Bangladesh who completed the online T4 Turning to Technology Global Survey⁶ were of the strong opinion that insufficient internet access constituted a hindrance to providing quality instruction in remote learning systems. The digital divide in accessing the internet is location-specific. Of teachers working in rural areas, 52% indicated that their school had access to the internet compared to 83% working in urban areas (T4, 2021).

Aside from access to the internet, teachers also lack access to the devices needed to develop their digital skills. This includes both school-owned and personal devices. In particular, teachers' access to high-tech devices such as tablets, computers and smartphones was identified as problematic (Khan et al., 2021). One survey of 201 teachers found that prior to the pandemic just 25% of teachers indicated that their school had a computer lab. Elsewhere, 39% reported their schools had multimedia classrooms (Khan et al., 2022). Haque et al. (2017) identified that primary teachers complained about the timing between when they received basic digital skills training and when schools receive digital devices. This translates into a lost opportunity for practising the skills teachers may have acquired. Equally, the problem of schools having digital devices but teachers being unable to utilise these due to the lack of digital skills training was also identified as problematic.

2.1.2 Digital skills training opportunities vary by education level with shortage in resources being a big barrier to progress

We have established that the shortfall in ICT infrastructure at the school level impedes teachers being able to put their training into practice. On the other hand, the Government of Bangladesh has made a great deal of progress in installing ICT infrastructure in Primary Training Institutes (PTIs) and Teacher Training Colleges (TTCs),⁷ which is needed to orientate and train teachers in digital skills. Under the management of *Aspire to Innovate (a2i)*, it is estimated that 300,000 primary and secondary teachers have been trained in ICT in Education. However, while progress has been made, equipment remains insufficient for the total number of trainees enrolled on courses. Presently, for example, there are just 60 computers available for more than 1,200 TTC trainees. Similarly, low numbers of master trainers compared to the number needed to coordinate ICT training of trainers is an issue. This is particularly the case at primary level. While there are 1,000 master trainers to help coordinate the training of trainers needed to provide ICT skills training to secondary school teachers, the equivalent for pre-primary and primary school teachers is just 300. This is despite considerably higher numbers of primary schools and students in primary education (Haque, 2021).

⁶ The T4 Turning to Technology Global Survey which was administered between April–May 2021 set out to understand teachers' experiences of using technology to teach remotely. The survey collected 20,679 responses from teachers in 165 countries worldwide, including Bangladesh. More information on the survey can be found [here](#).

⁷ TTCs are specifically related to secondary school teachers, while PTIs are specific to primary education. TTCs are intended to cater for the training needs of both in-service teachers and pre-service secondary teachers. PTIs, on the other hand, are only intended for in-service primary teachers.

The Annual Sector Performance Report notes that in 2019 just 19% of government primary schools received training in ICT. At the secondary level, more than 183,000 secondary teachers had received in-person ICT training by 2018 (approximately 60% of the 300,000 secondary teachers) (Haque, 2021).

2.1.3 Lack of advanced digital skills required to teach effectively in blended education systems

Even where teachers have access to the devices needed for digital skills, teachers often lack the skills needed to utilise them in a pedagogically appropriate way (Khan et al., 2021). Khan & Kuddus' (2020) survey of 100 teachers found that while their access to technology and connectivity has improved, teachers identified a lack of adequate skills (79%), training (83%) and insufficient support (81%) as impediments to being able to use digital tools or devices effectively. For example, when it comes to *basic digital skills*, the majority of teachers have either never or rarely used email for communication or used standard file-sharing tools such as Dropbox or Google Drive. On the other hand, teacher proficiency in using social media appears to be higher, with 80% of teacher respondents to a recent Asian Development Bank survey indicating that they regularly use these platforms to communicate with one another (↑Haque, 2021). Complementary qualitative surveys appear to suggest that teachers made use of social media platforms - particularly Facebook - to deliver classes online or else communicate with students.

Only a minority of Bangladeshi teachers surveyed for the recent Asian Development Bank questionnaire possessed *advanced digital skills*, which involve teachers being able to use technology to engage with their students (Panth & Xu, 2021). The lag in teachers acquiring advanced digital skills appears to be due to several reasons. The first is that unlike the introductory ICT course – introduced in TTCs in 2017 – which is mandatory for all teachers, the advanced course is an elective, and therefore voluntary. The second reason is that currently there are no ICT trainers in government teacher training colleges who are trained to teach advanced ICT courses (Haque, 2021).

2.1.4 A digital divide impacts access to digital devices and digital skills acquisition

Bangladeshi teachers' access to digital devices and acquisition of digital skills differs by economic, personal and geographic circumstances. Rural schools and areas are more likely to lack the digital infrastructure required for teachers to undertake teacher professional development through online means or deliver classes remotely. As a consequence, teachers living in rural areas are more likely to lack ICT skills compared to their urban counterparts.

Another divide in digital skills exists by gender. Female teachers living in rural areas are less likely to be digitally literate compared to their male counterparts (Khan & Hasan, 2013). A recent Asian Development Bank survey also found that when it came to preparing digital content and computer efficacy, female teachers were less likely to have the basic requisite skills (Haque, 2021). Understanding some of the structural barriers female teachers may experience and how programs focusing on digital skills can overcome this is important. The M-Learning Program, for example, was found to benefit female teachers in large part because it caused minimal disruption to their family and school commitments (Imam, 2013).

Finally, teachers with more years of teaching experience are less likely to use technology compared to teachers with fewer years of teaching experience (Chowdhury, 2013). Shamim Miah et al. (2020) found that teachers with 11 years or more of teaching experience are less likely to utilize digital learning

opportunities compared to their counterparts with less teaching experience. This is supported by Hansson et al. (2018) who concluded that older teachers were less likely to use the Teachers' Portal. Khan et al.'s (2021) interviews with teachers indicate that a mindset shift is needed amongst older teachers when it comes to incorporating technology into their day-to-day teaching tasks. This is supported by Sarwar et al. (2020) who indicate that traditional approaches to pedagogy and assessment pre-Covid-19 acted as a barrier to technology integration.

Section 3: Initiatives aimed at improving teachers' digital skills in Bangladesh

Driven by its Digital Bangladesh 2021 strategy, the government has launched and implemented various mechanisms to build teachers' digital skills. Many of these aim to reach a wide catchment of teachers through the use of open online platforms. This section provides a summary of these initiatives.

Muktopaath programme

One of the main government programmes focusing on teacher skills is the Muktopaath programme. This was developed and launched by a2i in 2016 (a2i, 2016). Muktopaath was originally intended as a low-cost, e-learning platform to improve the quality of education through the upskilling of teachers. The programme has subsequently been expanded to students, migrants workers and health professionals (Zaman, 2021). Teachers (and other interested participants) earn certificates by completing courses and undertaking assessments including quizzes, assignments and exams. In 2018, prior to the expansion of the offering, over 130,000 users participated on the Muktopaath platform, with course completion rates between 30% and 50% (Uddin et al., 2020). The most recent data as of 2022 indicates that two million participants were enrolled on different courses offered by the Muktopaath programme. Of these, one million have completed the courses (personal correspondence with a2i officials).

Standard Muktopaath courses on teachers' digital skills focus either on using Microsoft Powerpoint to develop multimedia presentations or else on Zoom to facilitate online classes. The most comprehensive course on Muktopaath relating to digital skills is the Basic Teachers Training (BTT) course. This consists of 38 lessons of video instruction and covers content ranging from opening and renaming files and folders to using or enabling a hotspot, to setting up an email account. To date, more than 25,000 secondary or higher secondary teachers have registered for the course. There is no information on a similar course offering for primary school teachers on the platform. In general, a2i's initiatives have focused on training secondary teachers, meaning that primary teachers have received fewer opportunities to develop these skills compared to secondary school teachers (Ivy, 2021). It should be noted that while Mukhtopaath offers comprehensive ICT skills acquisition opportunities, a formal online certification course or programme has yet to be introduced (Ministry of Education, 2019).

Teachers' Portal

The Teachers' Portal was launched by a2i in 2013 as an online social platform for teachers to view, download or upload digital educational content from across a wide array of subjects.

The primary objectives of the portal are to:

1. Establish an online professional development platform for teachers through peer-to-peer learning
2. Develop an online repository of quality educational content
3. Create a platform for idea generation and problem-solving on educational pedagogy and use of ICT in education
4. Develop a collaborative environment for lifelong learning support

An important aspect of the Teachers' Portal is the opportunity for peer-to-peer learning. As evidenced-based guidance from reports suggest, peer collaboration helps teachers develop and increase their digital skills because they can support each other in their learning (EdTech Hub, n.d.). The Teachers' Portal provides a platform where this integral learning method for teachers is present. Teachers receive constructive feedback and suggestions for areas for improvement on their submitted content from other teachers, helping them develop their skills and create better content. Since its launch, more than 369,000 teachers have registered and joined the portal (a2i, 2019). A 2018 review of the Teachers' Portal found that more than 60% of respondents reported that the primary benefit of the portal was skills development through communication and sharing. Amongst the study participants, 55.4% stated that they achieved improved content development skills. Elsewhere, 22.3% responded that the portal assisted with improved facilitation skills and 16.9% of teachers reported their computer-related skills improving (Hansson et al., 2018).

ICT for Education (ICT4E)

Another government initiative to increase teacher digital skills is the ICT4E project which is an a2i project being delivered in partnership with the Ministry of Education and the Ministry of Primary and Mass Education. The ICT4E project focuses on equipping teachers with ICT knowledge through an 'each one teach one' philosophy. Appointed ambassadors at the district level advocate for and educate teachers on the value of ICT skills to improve classroom experiences through the introduction of multimedia teaching materials. These 1,200 ambassadors, selected on the basis of their ICT and pedagogical experience (a2i, 2018), work to support teachers in their adoption of multimedia classrooms (MMCs), digital and model content and overall digitisation within their respective classrooms. Additionally, these ambassadors, across all 64 districts of the country, are tasked with promoting the embedding of ICT into education and building capacity through in-house training for teachers (along with educational administrators and parents/guardians) and seminars to demonstrate basic digital skills (a2i, 2019). To qualify for consideration as an ambassador, teachers must be active on the Teachers' Portal and have completed online training courses on Muktopaath.

Pre-Service Digital Skills Teacher Training

During pre-service teacher training, both primary and secondary teachers receive a mandatory training course that includes basic digital skills (Khan et al., 2021). Moreover, for secondary teachers, there is a one-year B.Ed (Bachelor of Education) programme that includes a mandatory ICT curriculum, which includes basic training on the Microsoft Office suite (Word, Powerpoint, Excel), the Internet and Open Educational Resources (OER). Additionally, the ICT curriculum covers cyber safety and security, guidelines for use of online resources, copyright and plagiarism rules, and basic electronic communications (Podder & Riad, 2020). At the primary level, modern ICT laboratories have been established at 66 PTIs to enhance the basic ICT skills of teachers while 330 master trainers have been trained to coordinate the training of trainers to provide ICT skills training primarily focused on developing class materials for teaching-learning. Prior to the Covid-19 pandemic, distance learning programmes (via internet, radio or TV) and online teacher

training courses for primary teachers had not yet been introduced (Ministry of Education, 2019). Similarly since Covid-19, no digital skills training is offered to trainee teachers (Correspondence with a PTI representative).

Section 4: Gaps in the provision of teachers' digital skills in government programs

Section 1 outlined some of the main government policies relating to teachers' digital skills training and development. While the government has made strides to realise these outcomes through the programmes mentioned in Section 3, gaps still exist. A progress review report on the Master Plan in ICT in Bangladesh discusses where implementation can be strengthened such as developing more professional digital skills training for teachers, improving standards of teaching through the use of ICT and ensuring wider access to technology for teaching-learning environments (Ministry of Education, 2019).

4.2.1 Lack of digital skills training for teachers, especially at the primary level

Most digital skills training opportunities available are mainly geared towards secondary teachers. Targeted digital skills programmes for primary teachers have not been introduced and, as a result, primary teachers have not been able to be upskilled to utilize ICT effectively within their classrooms (Ministry of Education, 2019). This also means that primary teachers face greater challenges in accessing or producing digital content compared to their secondary colleagues (Ministry of Education, 2020).

4.2.2 Training courses rarely equip teachers to use their digital skills to improve pedagogy

Government training programmes focusing on digital skills have, to date, focused on acquiring basic digital skills relating to how to start and use laptop devices or basic software packages (Khan et al., 2021). Training in advanced digital skills – particularly in how technology can be used to support student learning – is less widespread (Panth & Xu, 2021). Teacher education programmes appear to focus much more on learning *about* ICT, rather than on supporting teaching *with* ICT (Chowdhury, 2013). Teachers' current understanding of how to use basic digital devices is not sufficient to fully integrate ICT into education. Teachers require training and skills development to effectively integrate ICT into teaching approaches (Greenwood et al., 2013). This is particularly important for blended learning environments.

4.2.3 Most digital skills training is offered online, which limits access

The teachers who have access to devices and internet connectivity are, unsurprisingly, those who are most likely to engage in digital skills training. This is compounded by the fact that most digital skills training is provided online. This means that only a small proportion of the teaching force in Bangladesh can access these programmes. The provision of interest-free loans and grants for teachers to purchase computers, laptops and other ICT equipment was an activity proposed in the Master Plan for ICT in education. However, it is yet to be implemented and has been identified as one of the key reasons why teachers do not

feel motivated to use ICT (Ministry of Education, 2019). While the cost of hardware, as a share of per capita income, continues to decline, it remains expensive and unaffordable for most teachers.

4.2.4 The quality of online course content varies and teachers do not all graduate from their courses with a consistent skill set

While the Teachers' Portal focuses on providing an online repository of content by teachers for teachers, moderation of quality requires improvement. The three best teachers per week are selected based on online ratings by fellow users of uploaded content; however, this content is not verified for accuracy or alignment with the intended objectives of the respective curriculum. a2i identified that there are over 140,000 items of content available on the portal and the lack of verified or 'model' content posed a challenge (a2i, 2019). Although a2i has tried to address this by teaming up with the Ministry of Education, experts from the National Curriculum and Textbook Board (NCTB) and the TTCs, and with the 45 top teachers to jointly develop 1,000 items of high-quality content, more needs to be done by way of moderation for widely-circulated user-generated content. It is also important to ensure the relevance and currency of content available on this portal. The Ministry of Education has identified the importance of maintaining relevance by updating content every three years (Ministry of Education, 2019).

4.2.5 The absence of a government certification process makes it difficult to identify teachers' digital skills

Different online courses relating to teacher digital skills have been made available through the Muktopaath platform. However, currently, teachers are not assessed on their digital skills once they have completed these training courses. Certification for these online teacher courses has yet to be introduced (Ministry of Education, 2019). While pre-service teacher ICT training is within the scope of teacher's education, digital skills obtained through online platforms have no official certification associated with them.

4.2.6 Lack of comprehensive data about which teachers have participated in courses

The Muktopaath platform was originally intended for teachers. However, it has since expanded to include a number of other groups of users. Some of the key gaps in the data management of the platform is that information cannot be disaggregated based on the type of user utilising the platform. It also does not track individual users to provide more insight into the types of courses they enroll on or the time spent on the platform. As such, data is not available on the number of teachers using the platform, their chosen courses and completion rates. Similarly, when it comes to the Teachers' Portal, while this is an exclusive space for teachers to engage in peer-to-peer learning, there is still a lack of available information on the demographics of the teachers using the platform. These gaps in data hinder the understanding of teachers' digital skills training.

Section 5: Key Recommendations

Incentivize teachers to gain digital skills for use in their teaching practice. Currently, digital skills are not a prerequisite for entering the teaching profession for primary school teachers, and secondary school teachers are only required to have basic digital skills (Haque, 2021). To encourage teachers to attain digital

skills, developing a system that adequately rewards those teachers who invest in their personal development is needed. A number of options could be explored, which could include both monetary and non-monetary incentives. Government could also consider including this criteria when selecting the best teacher award at the upazila level.

Consider mandating pedagogy-focused digital skills training for pre- and in-service teachers that charts a clearer trajectory towards impact on student learning. Beyond the acquisition of basic digital skills, teachers' use of digital devices to support pedagogical approaches across the different areas of the curriculum is an area where large gaps currently persist. These advanced digital skills are currently offered as an elective, rather than a mandatory course for teachers (Haque, 2021). As a first step, more robust evidence is needed to understand what impact teachers' acquisition of pedagogy-focused digital skills has on student learning outcomes. Upon establishing this, the Government of Bangladesh can consider the types of digital skills that should be made mandatory. This could also imply that teachers will need to be supported to develop subject specific pedagogical and digital skills by providing continuous teacher training and coaching. These digital skills would fall under those that teachers can use to develop teaching knowledge, lesson planning or communication and collaboration (EdTech Hub, n.d.).

As part of efforts to develop a robust certification process, the governance around the provision of digital skills to teachers must be streamlined. Currently, a number of different government entities are involved in the delivery of digital skills to teachers. Based on findings for this review, we identify that Muktopaath, the Teachers' Portal, ICT4E, PTIs and TTCs are all in some way involved in digital skills development for teachers with no one entity having complete oversight. This has resulted in a fragmentary and uncoordinated approach to achieving government objectives around teachers' digital skills, which in some cases also duplicates efforts. This review recommends one main entity having oversight over the governance of teachers' digital skills or at least better coordination achieved through a master plan for training teachers at Ministry level.

Put in place a mechanism that allows for courses on the Teachers' Portal and other TPD platforms to be evaluated by teachers to aid their professional development. The 140,000 courses available on the Teachers' Portal are of variable quality. A process for validating and verifying which of these courses – and those on other TPD platforms – are appropriate for the type of digital skills that the Government of Bangladesh would like teachers to attain is needed to ensure demand side offering being addressed. Likewise it is also important to keep the teachers engaged when developing the content of these trainings.

Develop a certification process for accredited courses taken on online TPD platforms such as Muktopaath. Certification for teachers' digital courses taken on the Muktopaath platform is currently limited to attendance-based confirmation rather than an assessment of the skills attained. In validating accredited digital skills attained on Muktopaath and other TPD platforms through a formal certification process, a minimum threshold of digital skills acquired could be developed for the system. This would also support data collection efforts on teacher digital skills, which is currently almost entirely absent.

There is a need to undertake a situational analysis that explores teachers' access to digital devices and training based on their socio-economic background. While research exists on the barriers students from different backgrounds face in accessing and using technology, less global evidence exists that incorporates the nuances relating to teachers' backgrounds and the impact of this (De la Calle et al., 2021). As highlighted in Section 2.1.4, a digital divide exists between teachers depending on their background.

Depending on a teachers' economic, social and geographical background, some teachers will have less access to digital devices and training than others. A more nuanced understanding of the barriers faced by these groups is required to support the holistic adoption of digital devices and digital skills. The contextual understanding of teachers' access to digital devices and training is also important to determine under what conditions “no”, “low” or “high” tech options are most appropriate.

Ensure that sufficient digital devices are available for teachers to effectively put into practice training they receive in digital skills. One of the problems identified with the current digital skills landscape for teachers is the poor sequencing between the training that teachers receive and their being able to put into practice their newly acquired skills (or vice versa) (Haque et al., 2017). The ICT resources needed to support teacher training are often limited, and this has been identified as a reason why the training of teachers in digital skills is sometimes ineffectual (Haque, 2021). There is also a gap in terms of tools which the teachers currently have for assessing classroom level measurement of student learning levels. The Government of Bangladesh must, in the short term, align the targets relating both to the infrastructural availability for PTIs and TTCs and the number of teachers that will be trained in digital skills

Empower and promote teacher digital skills enhancement efforts to produce and mainstream digital content creation and practice. One of the underlying problems relating to the training of teachers in digital content creation is the shortfall in teacher trainers with mastery in ICT. Subjects relating to ICT are currently being taught by non-ICT teacher educators (Haque, 2021). This is particularly problematic when it comes to mastery of advanced digital skills with there currently being no ICT trainers in government TTCs who are trained to teach advanced ICT courses. To ensure that teachers can effectively deliver content to students both face-to-face and remotely, they need training in these advanced pedagogy-focused digital skills. Given the size of the teaching workforce in Bangladesh, one approach could be to use a cascade model where these teacher trainers can support to create a pool of master trainers who can then conduct more trainings at field level. This requires the Government of Bangladesh to set an ambitious target when it comes to recruiting the number of teacher trainers in TTCs and PTIs with mastery in digital skills – particularly for pedagogy-focused digital skills (or advanced digital skills).

Develop systems to generate reliable and systematic data on teachers' access to digital devices and training. The current information relating to teachers' access and needs in relation to digital devices and digital skills is fragmented, unreliable or – in some cases – completely unavailable. While a number of quantitative and qualitative studies have tried to capture this information during the Covid-19 pandemic, further systematic data, which takes into account the different contexts teachers are teaching in, is urgently needed to understand the state of teachers' digital skills in Bangladesh. Preferably, existing data collection mechanisms which are embedded in the system – such as the Bangladesh Bureau of Educational Information and Statistics (BANBEIS) survey – would be utilized to collect data on teachers' digital skills in a more systematic way.

Chapter 7: Education Management Systems - EMIS, Procurement, National Assessment

This chapter focuses on education-related systems. The definition of systems in this chapter covers (1) digital platform for Education Management Information System, (2) government system for the procurement of digital tools, and (3) assessment system during/after COVID-19 pandemic. As educational data infrastructure, we firstly review the current situation of complicated education management information system (EMIS), student tracking, assessment, and procurement. Then we discuss the necessity actions, such as integrated EMIS, capacity building for operating the systems, and procurement reform for securing the quality and maintenance.

Education Data Infrastructure

EMIS

An education management information system (EMIS) provides systematic, quality data in a well-structured enabling environment that facilitates utilization of the information produced in planning and policy dialogue.

The education sector in Bangladesh is familiar with utilizing Education Management Information System (EMIS) while there is absence of a unified platform across sub-sectors. The respective ministries/divisions in-charge of education sub-sectors manage respective EMIS separately. Currently there are four different EMIS systems fragmented through four directorates managing four major sub-groups – DPE for pre-primary and primary education, DSHE for secondary and higher secondary education, Directorate of Technical Education for TVET and Directorate of Madrasa Education for post-primary Islamic education stream. These directorates collect data from education institutions under their management separately and in some cases digital tools are used for collecting and storing data. In addition, there are data on teacher recruitment and training administratively collected by teacher training academies, there is National Curriculum and Textbook Board, nine examination boards across the country, and financial reporting mechanism. All of these are operated and managed without interconnectivity which results into loss of efficiency of the system while EMIS systems are meant to achieve the contrary.

Lack of interconnectivity among fragmented EMIS systems is leading to loss of time and resources. One of the main purposes of mainstreaming an EMIS system is to reduce overall cost of collecting, storing, analyzing and disseminating quality data. In Bangladesh, separate EMIS systems operating under separate entities representing major sub-groups are struggling to achieve system efficiency due to lack of interconnectivity and interoperability among them. DPE administers Annual Primary School Census (APSC) every year while Bangladesh Bureau of Educational Information Statistics (BANBEIS) also conducts a census every year using web-based digital tools to collect data from all institutions of secondary level. And there is no synergy in method/process of data collection or functional operability on collected data. As a result, teachers, schools, field level education office staff provide the same information to

different agencies several times throughout the year, in some cases manually, leading to significant loss of time and productivity of human resources.

Uncoordinated systems may lead to poor planning and decision making specially on critical transitional issues. When systems are coordinated and interoperable throughout education sub-groups/sub-sectors, policymakers and practitioners can better plan and make informed decisions based on quality data driven analysis. The drop-out rate, student learning level per grade, gender disaggregated information, teacher capacity etc. data of primary level can support the secondary level policy makers to better manage the newly transitioned cohort and improve learning outcomes for the secondary level. Similarly, interoperable data systems may enable primary sub-sector to improve learner readiness for transitioning to secondary level. In Bangladesh, government agencies managing different sub-groups do not have access to each other's EMIS systems and in turn cannot make informed decisions based on holistic situation analysis.

Individual EMIS systems under education sub-sectors are also yet to reach full potential. The separate EMIS systems managed by separate agencies (e.g., DPE, DSHE) have not been fully efficient as there is lack of synergy among different portals and databases under one single system. For example, the EMIS system managed by DPE for primary education sub-sector has several data points and databases developed under different projects throughout different timeline (e.g., textbook distribution, teacher recruitment and training, stipend distribution purposes etc.). As these were developed at different points of time, the software technology and maintenance service provider has also been different. This has led to lack of interoperability among these sub-portals and databases compromising the efficiency of the EMIS system due to duplication of data collection, entry and storing. Different technologies used across these tools are limiting interoperability, scalability, security, accuracy, and utility of the overall system. This lack of integrated functionality issue of several data points, sub-portals and databases is posing a challenge to ensure system accountability and institute an evidence-informed decision-making culture.

Box 1: Current EMIS systems in Bangladesh Primary and Secondary Education Sub-sectors

In the primary education sector, information about schools is collected via adhoc data collection efforts and not stored in a central, accessible location. Under the leadership of the Information Management Division (IMD) of DPE, and closely working with several other divisions, including the Monitoring & Evaluation Division, Planning & Development Division, Training Division etc. the PEDP4 program with support from five development partners (World Bank, ADB, EU, UNICEF and JICA) is now supporting to establish an Integrated Primary Education Management Information System (IPEMIS) to improve DPE's decision making process through availability and utilization of better-quality data. On early 2022, the platform for Integrated web-based MIS has been established under PEDP4 which means the data management system/MIS has been established with school module, teacher module, comprehensive student module, APSC, textbook, PECE, and NSA data; and student MIS and teacher MIS have been updated and integrated into the existing DPE data management system. The next phase of this will be fully operationalizing the integrated MIS which is expected to be completed by June 2023. This will enable all different data points and databases under the whole primary education sub-sector to be integrated and different levels of access will be provided to concerned government officials and agencies ensuring transparent and efficient service delivery. This system is also expected to guide annual budget allocations by the Ministry.

The EMIS of secondary education has a web-based reporting feature to analyze data. This system is publicly accessible, and anybody who needs data can export them in Excel format to analyze. The directorate of secondary education produces the performance-based management report annually, based on secondary schools' performance. Under the ongoing SEDP program, it is expected to enhance the existing system with integration of financial management data system and school level grant management interface.

There remains capacity building need for both infrastructure and human resource specifically at the field level. Teachers and head teachers play an important role in the system success as they are the primary sources of school-level data. Lack of teachers' capacity and knowledge on data management and their understanding of the qualitative and quantitative data are one of the main barriers to collecting quality data at the primary and secondary levels. The head teacher feeds school data on the web-based software directly. The subdistrict and district-level education officers ensure the quality of the data. Many educational institutions still lack the required device to work online and the ones having the required device are often facing challenges to operate these due to lack of proper training. The schools that do not have the device have to reach out to nearby computer and internet facilities or Union Digital Service Centre/Union Resource Center to enter the data into the central data system. The government has taken several initiatives to provide ICT and digital literacy at school levels. However, these have not reached the desired outcome in terms of required capacity yet.

Government is cognizant on the sustainable integrated EMIS need for the whole sector as manifested in several national level policy and plans, but implementation as per plan is yet to be materialized. In the Master Plan for ICT in Education in Bangladesh (2012-2021) it was envisioned to establish a common platform that allow interoperability and standardization for all the education sub-sectors to facilitate an exchange of information, policies, standards, and frameworks. However, the implementation progress of such platform has no progress yet (Ministry of Education, 2019). In addition, for the formal sub-sectors of education, the Master Plan also included a provision for Non-Formal Education (NFE). However, currently

there is no standard or framework for the development, enlargement, and coordination of a Non-formal Education (NFE) Management Information System (MIS). The NFE MIS would further enable policy makers to access NFE statistics and to prepare data-informed policies and plans. The recently developed National Blended Education For All (BEFA) Masterplan (2022-2041) also has provision for an integrated sector-wide EMIS and indicative budget for it. A comprehensive roadmap with specific coordinating and leading responsibilities assigned for involved ministries/agencies would be required to ensure timely implementation of this.

Student Tracking

In promoting LMS, a system for identifying students and tracking data from a long-term perspective is also being considered. Stakeholders indicated it would be ideal to have a student tracking system online. Government is planning to provide a unique ID to about 45 million students from pre-primary to the university level in the country. Of them, around 16 million students are in the secondary to higher secondary levels and they will get their unique IDs first. As per the plan the unique ID of school students will be transferred to their national ID after becoming 18 years old.

The Bangladesh Bureau of Educational Information and Statistics (BANBEIS) has launched a project called "Integrated Educational Information Management System (IEIMS)" and are collecting information from students across the country. The unique ID initiative is expected to support tracking dropouts and prevent child labor and early marriages.

For implementing those student tracking systems, not only systems, but also government officers' capacity to manage/use such a system are needed. Moreover, a government officer said that some initial exploration in this idea was conducted, but the exercise deemed the project too costly.

Procurement

In the implementation of EdTech-related digital equipment procurement, there have been reports of project delays due to procurement challenges. For example, one development aid officer reported that while the project to introduce multimedia facilities to more than 23,000 secondary schools was successfully procured, the project to introduce them to primary schools has been delayed for seven years due to procurement problems, and still not all the schools have received the materials.

One main reason for this difficulty is the procurement challenge associated with the large lot size. When considering the procurement of digital equipment for EdTech promotion, digital equipment such as laptops, mobile phones, and audiovisual equipment are assumed. If these devices are to be distributed to the entire country, the government will need to procure them in very large lots. For example, if the government distributes to all teachers in elementary schools, more than 200,000 laptops would be needed. Even if there are only a few units per school, that would be about 100,000 units. This would make the procurement process complicated. Most of these devices are difficult to manufacture domestically and are currently dependent on imports. An interviewee who is a member of a development agency mentioned the lack of capacity to manufacture digital devices domestically.

Some domestic companies manufacture mobile phones and laptops. The reality is, however, that most of the PC parts are imported from overseas and the quality of domestic assembly is not high. It is not realistic to procure a large number of EdTech devices domestically.—Development agency officer

Regarding specific challenges in the procurement process, procurement specialists at a development agency said the difficulty of creating adequate procurement requirements and the difficulty of ensuring quality through inspection. As for determining the appropriate procurement requirements, it comes down to determining the exact functional requirements of the devices needed for the project. For example, when the government considers installing laptops for teachers in each school, the required specifications will vary greatly depending on whether it is used for presentation slides or for creating/editing videos. In addition, it is difficult for education professionals to clearly define technical specifications for multiple types of devices, such as multimedia, network equipment, and digital devices for teachers/students in different geographical situations and areas. Therefore, there was a recommendation by an interviewee that advice from consultants with expertise in technology and education and support from government agencies with strong technical expertise, such as the Bangladesh Computer Council (BCC), are important.

Another major challenge is the difficulty of ensuring quality through inspection. When several hundred thousand digital devices are procured, it is almost impossible to verify the quality of all the devices. For example, when hundreds of thousands of devices are delivered to a central ministry, such as the Ministry of Education, even 1% of the total number of devices is several thousand, making the inspection process extremely difficult. On the other hand, when inspecting on-site, the quality of the inspection is also an issue. Especially in the case of a project that includes rural areas, it is difficult to conduct inspections on-site at the same level. A government official also pointed to the behavior of service providers as difficulty in quality procurement; some suppliers try to deliver products that are not of high quality, and there have been cases of poor service by service providers compared to the level of responsibility expected in the procurement.

One idea to improve the quality of inspections at the field level is to collaborate with higher education institutions. To perform inspections correctly, it is necessary to secure personnel with high technical skills, but it is difficult for local governments and government agencies to secure and deploy personnel with high technical skills nationwide in a short period of time. On the other hand, since universities and engineering and technology universities are located in each division, their human resources (knowledge and technical skills of faculty and manpower of students) may be utilized to improve the quality of inspection. This will not only improve the quality of inspections but also contribute to the promotion of government-academia collaboration and increase the practical experience of students during their university life.

Moreover, even if teachers were able to procure the necessary equipment for EdTech, it is another challenge to maintain and continue to use them. This is not limited to Bangladesh, but is often cited as an example of the difficulty of equipment-based development assistance (Heeks, 2002). In particular, because most digital devices are manufactured outside of Bangladesh, they heavily rely on imported materials for maintenance. Furthermore, when it comes to remote areas, the maintenance of devices becomes more difficult due to the lack of specialists and parts, as well as the many factors that can shorten the life of devices, such as power outages and dust intrusion. Therefore, it is crucial to find and cultivate local ICT firms that can handle large volumes of EdTech devices. In addition to the challenge of continuous use of hardware, the continued use

of software services is also a challenge. Recent software and services have become subscription-based, requiring a small initial investment with recurring costs. This situation means that conventional procurement methods can no longer handle information systems. Typically, the beneficiary side bears post-implementation maintenance and management costs. However, recent system operations that need continuous service costs no longer cope with conventional procurement methods based on a one-time purchase of goods.

In sum, for improving procurement, it is necessary to approach multiple factors: technical requirements, inspection, and maintenance. For example, technical support should be incorporated into the procurement content, and service level agreements should be signed. In other words, it is important to add responsibility to both procuring goods and maintaining services. In addition, collaboration with universities for inspection (inspection) and local ICT companies (maintenance and service level agreement) is recommended.

Assessment

Integration of EdTech approach in student assessment is at a nascent stage in Bangladesh. The assessment process in basic education largely depends on summative assessment and high-stake public examinations (e.g., at completion of Grades 5, 10, 12). While managing data and logistics of these nation-wide public examinations are assisted by digital tools and web-based support, utilization technology in administering and conducting assessments is not in practice in the country. The concept of continuous and formative assessment is gradually being advocated and introduced in the primary and secondary sub-sectors but is not mainstreamed yet. The required infrastructure and capacity building of human resources for this is also currently absent.

National level student assessments in both primary and secondary sub-sectors of Bangladesh can improve efficiency through technology driven transformation. National level assessments have been proven to be significant for data driven evidence-based planning. But there is scope for improvement in technology driven capacity development to be able to utilize the outcome of these assessments in policy planning to improve learning outcomes. For example, the National Assessment Cell (NAC) of the Monitoring and Evaluation Division of DPE is accountable for the administration of the National Student Assessment (NSA) at the primary level. However, due to lack of qualified human resources the NAC remains dependent on external service providers and the National Curriculum and Text Board (NCTB) for test item development and analysis of NSA results. Student results from the nation-wide Primary Education Completion Examination (PECE) is entered to standalone databases on Upazila Education Office's computers, copied on to external data drive manually and sent to the District Primary Education Officer's (DPEO) office. The DPEO then sends the collection through to IMD at DPE. The manual data entry collection at the field level every year requires significant time and involvement of human resources while posing risk of compromising data quality which can be avoided if this process can be digitized from bottom-up. This will also ensure data integrity and efficient planning based on student learning outcomes with difference in learning levels across country/divisions/districts.

Box 2: Digital Platform for Formative Assessment in Primary Education Sub-sector

A digital platform is planned to be developed to conduct formative assessment and lesson observation digitally with technical assistance from ADB. Once fully developed, the platform is to be deployed on Directorate of Primary Education (DPE) server system for local ownership and maintenance ensuring sustainability. The platform is planned to be customized from a globally recognized open-source software, that facilitates electronic data collection, formative student assessment, teacher coaching, and program monitoring. The platform will be compatible for usage from mobile devices, tablets and computers.

The platform is expected to primarily include formative assessments items for Grade III Bangla and Mathematics, aligned with the textbooks. The teachers will use this platform to regularly conduct formative assessments for students and use the result to inform and adjust their teaching practice. All data from the assessments will be stored in the platform and auto-generated reports will be available. The reports and assessment data will be accessible by officials of all levels, from school to central.

The platform also includes a classroom observation tool which has been developed based on the DPE e-monitoring checklist and academic supervision tool. These observation data can be linked to the formative assessment records. The supervisors can easily see the assessment results and observe whether the teacher changes the instruction and addresses the learning needs based the previous formative assessment data.

The digital platform is planned to be piloted in 120 government primary schools in two phases. For piloting, the teachers will be provided with Tablets. The digital platform for formative assessment and supervision will be integrated in DPE's IPEMIS and DPE will have full control over it for upgradation and implementation. Moreover, the scale-up of this will be supported by PEDP4 DLIs to include the implementation of the platform in 1000 more primary schools.

Key Recommendations

The success of a functioning integrated EMIS depends equally on a trained education workforce including teachers, field officers and other decentralized staff. Human resources should remain at the center of the capacity development initiatives in EMIS reinforcement. A sustainable training and capacity building plan should exist with flexibility to ensure it covers and accommodates the constant evolution of both technology and education system and the capacity building approach should be continuous. Along with ensuring the education workforce have the competencies needed to run the EMIS, deriving insights from the data stored within it to make meaningful insights should also be prioritized. When the EMIS software is procured from an external provider, the service package should include a sustainable capacity building plan for the procuring entity/ministry (World Bank, 2016). This would prevent the lack of in-house technical competency leading to overdependence on external providers repeatedly affecting ownership and resulting in inefficiency of the system (Adam, 2011; Abdul-Hamid, et al., 2017). In developing economies, government's lack of capacity to maintain a functional EMIS has been resulted by these in-house sustainability failures (Heeks, 2002).

Cooperation with higher education institutions can be effective for improving inspection of digital device procurement. Since universities and engineering and technology universities are located in major cities, their human resources (knowledge and technical skills of faculty and manpower of students) may be utilized to improve the quality of inspection. This will not only improve the quality of inspections, but also

contribute to the promotion of government-academia collaboration and increase the practical experience of students during their university life.

Maintenance system of EdTech devices should be secured. It is important to establish a system that enables EdTech devices to use for a long time after the equipment has been procured. Some recommended actions are (1) to have a service level agreement with procurement agents to maintain the level of delivery and (2) to consider using the Union Digital Centers for supporting maintenance of hardware and software for all digital assets used by education beneficiaries.

Chapter 8: Conclusion and the Way Forward

The COVID-19 pandemic and the related school closures forced governments to expand ICT use in the education sector. The Government of Bangladesh's remote learning response was prompt in large part due to its prior investment in ICT platforms and the expertise of organizations such as a2i. However, the pandemic also highlighted some of the major challenges with ICT-based delivery at scale: device access, cost of accessing internet, teachers' capacity to use ICT effectively, administrative capacity/monitoring and a host of other barriers common in low-resource contexts. The learning loss projections presented in this report highlight the dire situation facing students, teachers, parents in the recovery period following school reopenings. The government should apply the key findings of the pandemic period and adopt ICT approaches that will aid the learning recovery and beyond. After discussing some key takeaways from the study, we outline actions government can take to improve the use of ICT in the education sector.

Government's commitment and buy-in to leverage ICT in education service delivery is reflected in recent efforts, programs and policy directives. However, the effectiveness of these efforts will largely depend on coordination among education ministries, implementing agencies, and their approach towards ICT4E adoption. The recommendations in this report aim to support the strategic development with suggested interventions that are implementable on the short and medium-term. Several of these recommendations can be addressed through effective design of upcoming Bank-supported operations such as: the Learning Acceleration in Secondary Education (LAISE) project focusing on secondary and higher secondary education. LAISE aims to provide support to the Ministry of Education (MoE) in the short to medium term to resolve critical issues to reduce digital divide and enhance digital skills through training on ICT competency, supply of equipment, awareness campaign and community mobilization.

Effective implementation of the government's blended learning master plan will largely depend on coordination among ministries and implementing agencies and their adopted approach. The draft master plan covers all the critical key elements and focuses on all the right interventions to achieve its goal. However, the existing lack of coordination among involved ministries and implementing agencies will need to be changed through commitment from these multiple actors. A comprehensive roadmap (or terms of references for coordination) with specific coordinating and leading responsibilities assigned for involved ministries/agencies would be required to ensure timely implementation of this. Bangladesh Research and Education Network (BdREN) governed by the University Grants Commission (UGC) can be an existing institution to support basic education sector with capacity building and existing digital infrastructure support. Beyond players within the government, collaborations with private sector can also be beneficial.

For example, to upskill the teaching workforce, MoE can collaborate with platforms such as Muktopath to offer professional development opportunities in a hybrid and efficient manner.

It is important to further explore the landscape of blended learning in Bangladesh and its potential with a deep dive in beneficiary perspective and demand as the EdTech Ecosystem. The remote and remedial learning activities introduced during pandemic induced school closures could have been benefited from incorporating perspectives or opinions of students, parents, teachers and community as evident from national and global experience. In addition to rapid student assessments, situational analysis on teacher professional development and digital device availability, suggested throughout the report, further deep dive on community inclusion and impact evaluation of recent technology take-up, connectivity issues, behavior aspects and financial models to reduce the digital divide would enhance the knowledge base of ICT4E incorporation on Bangladesh basic education sector. Child safety/digital security issues are seen to be emerging which needs to be duly addressed by the government. In order to combat these sensitive challenge, this report encourages the government to engage on a multistakeholder policy dialogue in the near term. In addition, dissemination of the key recommendations of this report to key ICT4E actors in Bangladesh, including prominent tech companies, NGOs, other funders/donors, and the media operating in Bangladesh, will be an important implication in shaping the EdTech Ecosystem in Bangladesh.

Recommendations

Domain 1: Leveraging ICT for the Learning Recovery

■ Learning Assessment

- **Government and its partners should pilot using remote, phone-based assessments to track and monitor student learning progress, assess the effectiveness of interventions, and to direct support where it is needed most.** Researchers have used remote assessments, a low-cost alternative or complement to in-person assessments, in a variety of contexts to assess student knowledge during the pandemic.
 - While phone-based assessments hold promise, further research is needed to establish their reliability. **For this reason, GoB should consider piloting these assessments in partnership with research organizations that specialize in education measurement.**

■ Adaptive Learning

- **The government should explore ways to boost take-up of personalized learning platforms such as Robi 10-minute school and MindSpark.** Piloting the curriculum-linked gamified learning platform for Grade 6 and 7 students developed by UNICEF and a2i would be a useful step in this direction. These platforms have the added benefit of being able to certify student learning levels which may prove useful for assessing the state of student learning and for credentialing purposes.

■ Telementoring and Tutoring

- **Government should pilot telementoring or phone-based support programs for students.** Several studies have found that phone-based teacher support, mentoring, or

instruction can help achieve better student learning outcomes and boost parental engagement.

- **In consultation with experts, government should explore ways to support the use of tutoring services (for example, through a cash transfer or subsidy) or offer those services itself (for example, see the G-United program implemented in Kenya).** Tutoring services are widely used by parents and students and constituted a key way that students continued learning during the pandemic.

Domain 2: Digital Infrastructure

■ Device Access

- **Distribute devices to each teacher and student.** For teachers, to create digital content and conduct online classes, not only device distribution to schools, but also device distribution to each teacher is necessary. In the interviews with Bangladesh government officials, several interviewees mentioned the dissemination of devices to teachers as a main challenge for implementation of blended learning. Students also need digital devices for accessing blended learning and digital content created by the government. This study suggests the need to conduct a technical assessment for affordable and accessible devices for students or education hub at the remotest part to ensure students participation in blended learning.

■ Internet Access

- **Providing subsidy or free access to education content with the collaboration between government and private mobile companies should be considered.** Some of the global initiatives could be also explored are those that works to craft compelling investment cases for blended public private funding to build the connectivity infrastructure needed to deploy digital learning solutions and other services.

Domain 4: ICT and Ensuring Equity

■ Student Assessment

- **A rapid assessment of grade level preparedness of students is needed to place students in an appropriate recovery phase rather than using one approach for all.** Looking ahead to operating schools with some possibility of living with COVID indefinitely, the MoE will need to emphasize on unlocking the digital potential and making the blended approach to integrating the distance mode into regular teaching-learning.

■ Parental Awareness and Community Involvement

- **Awareness programs on learning recovery targeting parents and associated community members could be initiated in collaboration with government agencies and private sectors.** Parental awareness and the role of community members will be important factors for successful implementation of government's blended learning master plan and recovery strategy.

■ Finance

- **Innovative financing mechanism to reduce digital divide.** Ministry of Education can consider earmarked grants to schools for purchase of devices, internet cost and financing training of teachers. The current poverty targeted stipend scheme can be revisited to add a top up amount for students belonging from the rural and marginalized population, to mainly compensate for the internet connectivity cost.

Domain 5: Teachers' Digital Skills

■ Incentives

- **Incentivize teachers to gain digital skills for use in their teaching practice.** To encourage teachers to attain digital skills, developing a system that adequately rewards those teachers who invest in their personal development is needed. A number of options could be explored, which could include both monetary and non-monetary incentives.

■ Teacher Training

- **Consider mandating pedagogy-focused digital skills training for pre- and in-service teachers that charts a clearer trajectory towards impact on student learning.** As a first step, more robust evidence is needed to understand what impact teachers' acquisition of pedagogy-focused digital skills has on student learning outcomes. Upon establishing this, the Government of Bangladesh can consider the types of digital skills that should be made mandatory.
- **Ensure that sufficient digital devices are available for teachers to effectively put into practice training they receive in digital skills.** One of the problems identified with the current digital skills landscape for teachers is the poor sequencing between the training that teachers receive and their being able to put into practice their newly acquired skills (or vice versa) (Haque et al., 2017). The Government of Bangladesh must, in the short term, align the targets relating both to the infrastructural availability for PTIs and TTCs and the number of teachers that will be trained in digital skills.
- **Empower and promote teacher digital skills enhancement efforts to produce and mainstream digital content creation and practice.** One of the underlying problems relating to the training of teachers in digital content creation is the shortfall in teacher trainers with mastery in ICT. Subjects relating to ICT are currently being taught by non-ICT teacher educators (Haque, 2021). Given the size of the teaching workforce in Bangladesh, one approach could be to use a cascade model where these teacher trainers can support to create a pool of master trainers who can then conduct more trainings at field level. This requires the Government of Bangladesh to set an ambitious target when it comes to recruiting the number of teacher trainers in TTCs and PTIs with mastery in digital skills – particularly for pedagogy-focused digital skills (or advanced digital skills).

■ Improving Courses and Certification

- **As part of efforts to develop a robust certification process, the governance around the provision of digital skills to teachers must be streamlined.** Currently, a number of different government entities are involved in the delivery of digital skills to teachers. This review recommends one main entity having oversight over the governance of teachers' digital skills or at least better coordination achieved through a master plan for training teachers at Ministry level.
- **Develop a certification process for accredited courses taken on online TPD platforms such as Muktopaath.** Certification for teachers' digital courses taken on the Muktopaath platform is currently limited to attendance-based confirmation rather than an assessment of the skills attained.
- **Put in place a mechanism that allows for courses on the Teachers' Portal and other TPD platforms to be evaluated by teachers to aid their professional development.** The 140,000 courses available on the Teachers' Portal are of variable quality. A process for validating and verifying which of these courses – and those on other TPD platforms – are appropriate for the type of digital skills that the Government of Bangladesh would like teachers to attain is needed to ensure demand side offering being addressed.

■ Data Collection/Analysis

- **There is a need to undertake a situational analysis that explores teachers' access to digital devices and training based on their socio-economic background.** While research exists on the barriers students from different backgrounds face in accessing and using technology, less global evidence exists that incorporates the nuances relating to teachers' backgrounds and the impact of this (De la Calle et al., 2021).
- **Develop systems to generate reliable and systematic data on teachers' access to digital devices and training.** The current information relating to teachers' access and needs in relation to digital devices and digital skills is fragmented, unreliable or – in some cases – completely unavailable. Preferably, existing data collection mechanisms which are embedded in the system – such as the Bangladesh Bureau of Educational Information and Statistics (BANBEIS) survey – would be utilized to collect data on teachers' digital skills in a more systematic way.

Domain 6: Education Administration: EMIS, Procurement and National Assessment

■ Training and In-House Capacity

- **The success of a functioning integrated EMIS depends equally on a trained education workforce including teachers, field officers and other decentralized staff.** Human resources should remain at the center of the capacity development initiatives in EMIS reinforcement. When the EMIS software is procured from an external provider, the

service package should include a sustainable capacity building plan for the procuring entity/ministry (World Bank, 2016). This would prevent the lack of in-house technical competency leading to overdependence on external providers repeatedly affecting ownership and resulting in inefficiency of the system (Adam, 2011; Abdul-Hamid, et al., 2017). In developing economies, government's lack of capacity to maintain a functional EMIS has been resulted by these in-house sustainability failures (Heeks, 2002).

■ **Procurement and Maintenance**

- **Cooperation with higher education institutions can be effective for improving inspection of digital device procurement.** Since universities and engineering and technology universities are located in major cities, their human resources (knowledge and technical skills of faculty and manpower of students) may be utilized to improve the quality of inspection. This will not only improve the quality of inspections, but also contribute to the promotion of government-academia collaboration and increase the practical experience of students during their university life.
- **Maintenance system of EdTech devices should be secured.** It is important to establish a system that enables EdTech devices to use for a long time after the equipment has been procured. Some recommended actions are (1) to have a service level agreement with procurement agents to maintain the level of delivery and (2) to consider using the Union Digital Centers for supporting maintenance of hardware and software for all digital assets used by education beneficiaries.

Annex 1: KII Questionnaire

Section 1. Past and Present: Lessons learned from the pandemic

- *Initiatives that were in place pre-/during COVID-19*
 - Please list technology initiatives or programs in your agency/ministry executed or supported *prior to/during* COVID-19.
- *Initiatives that have worked*
 - Which of these technology initiatives or programs has been most effective in achieving their objectives? Why? Any evidence?
- *Initiatives that have not worked*
 - Which initiatives have not been successful? Why? Any evidence?

Section 2. Challenges: Key constraints on scale-up of education technology in Bangladesh

- *Digital infrastructure (connectivity)*
 - What are the biggest challenges EdTech initiatives face in the area of connectivity, such as network, device and logistics? How can they be overcome?
 - Majority of the educational institutions have less fixed broadband connections and more mobile connections, especially in rural areas, and it impacts more slower and interrupted connectivity. How do you see the action could be taken for more broadband / uninterrupted connection in educational institutions?
- *Applications of EdTech in the System*
 - Is EdTech currently used to track or keep records of students in the system (for example, by assigning them unique student identifiers)? What are the barriers in applying technology to track individual student progress and to learning management systems, more generally?

- In your view, how can technology improve other aspects of education administration (enrollment, logistics, human resources)? What is preventing Bangladesh from adopting the approaches you mentioned?
- Did you envision any enterprise architecture that seems to be effective for supporting education?
- *Equity and Accessibility*
 - What needs to be done to make education technology/initiatives more accessible to hard-to-reach and marginalized populations? (e.g., gender, rural area, minority)
- *Digital skills (teachers, administrators)*
 - What kind of capacity-building for teachers/administrators is necessary to scale-up education technology in Bangladesh? What kind of ICT pedagogy are you considering in the capacity building process for quality and effective learning?
- *Regulation*
 - What regulatory hurdles do you believe are preventing the effective scale-up of EdTech initiatives?

Section 3. Future: Key initiatives that will lead to better use of technology in education

- *Funding Priorities*
 - Imagine that your agency receives a new grant of X thousand dollars to implement EdTech projects. What are the areas would you prioritize spending on to generate the most improvement?
- How can blended learning be made most effective to recover learning loss? What are the factors that you could see most critical to implement this new learning process?
- What initiatives are being planned by your agency?
- What kind of initiatives would you support from other agencies/donors?

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