COVID 19, technology-based education and disability: The case of Bangladesh

Emerging practices in inclusive digital learning for students with disabilities
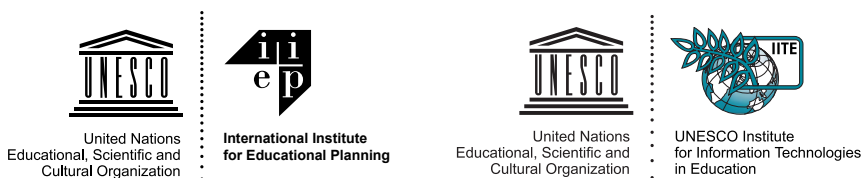
United Nations
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in Education

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A student with a visual impairment using a smartphone to read accessible books.

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Abbreviations and acronyms

a2i	Access to Information/Aspire to Innovate
ABC	Accessible Book Consortium
ARM	Accessible Reading Materials
BBS	Bangladesh Bureau of Statistics
BRAC	Building Resources across Communities
CSO	civil society organization
CRC	Convention on the Rights of the Child
CRPD	Convention on the Rights of Persons with Disabilities
DAISY	Digital Accessible Information System
DISSCU	Disabled Students' Society of Chittagong University
DSS	Department of Social Services
FGD	focus group discussion
GPA	grade point average
ICT	information and communication technology
INGO	international non-governmental organization
IRCD	ICT and Resource Centre for Persons with Disabilities
KII	key informant interview
MTB	multimedia talking books
NCTB	National Curriculum and Textbooks Board
NGO	non-governmental organization
NPRP	National Preparedness and Response Plan
OPD	organization of persons with disabilities
SDG	Sustainable Development Goal
UDL	Universal Design for Learning
UGC	University Grant Commission
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
WIPO	World Intellectual Property Organization

Overview

Throughout 2020, the COVID-19 pandemic posed unprecedented challenges for national education systems. All learners have been impacted by school closures and the disruption to learning; however, vulnerable and marginalized learners, such as children and young people with disabilities, have been disproportionately affected (UNESCO, 2020; World Bank, 2020). Bangladesh is no exception in this regard. Indeed, the country's National Preparedness and Response Plan (NPRP) for COVID-19 takes a national, pro-poor approach, but lacks specific mention of ensuring inclusive and accessible education for children and young people with disabilities. Although the NPRP addresses the needs of vulnerable groups in more general terms – along with the provision of emergency supplies, education, and emergency services to 5 million people – it offers no precise plan for persons with disabilities.

This study sheds light on Bangladesh's initiatives in the area of disability-inclusive education. The particular focus is on the role of its Accessible Reading Materials (ARM) initiative and how this has contributed to ensuring disability-inclusive and accessible education during the COVID-19 pandemic in Bangladesh. ARM is a government-led initiative that was launched in 2014 by the then Access to Information (a2i) programme of the Prime Minister's Office, now the Aspire to Innovate Programme of the Information and Communication Technology (ICT) Division of the Government of Bangladesh. It was launched in recognition of the need for solutions to ensure virtual, as well as regular reading access for all students, including children and young people with barriers to reading. ARM is aimed at satisfying the educational needs of all students including students with print and learning disabilities.

The main challenge in the area of accessible and inclusive education in Bangladesh is that most publications remain locked in printed form or non-Unicode colonial font, and are inaccessible to persons with disabilities – including those who need materials in accessible formats. This situation became more pronounced following the countrywide lockdown and related closures of educational institutions. As a result of the closures, Bangladesh's millions of schoolchildren found themselves deprived of learning materials.

This study's focus is on the ARM initiative and its effectiveness during the pandemic. It has also considered the additional complementary initiatives undertaken by the government during the pandemic to distribute materials among beneficiaries via its online, offline, and media platforms. These are included below after the section on the recommendations and conclusion of this study.

Key implementers

a2i – Access to Information

Initiated in Bangladesh in 2007 by the Prime Minister's Office (with support from USAID and the United Nations Development Programme [UNDP]), the objective of the a2i programme is to increase transparency and improve governmental efficiency in public service delivery. The main focus of a2i is to make information and services available to citizens and reducing inefficiencies in terms of accessing governmental services (Rahman, Aminuzzaman and Ahmed, 2019).

Goal of the a2i programme:

To ensure easy, affordable and reliable access to quality public services for all citizens of Bangladesh.

a2i seeks to:
- empower civil servants with the tools, expertise, knowledge, and resources they need for experimenting with and innovating citizen-centric solutions to public service challenges;
- establish both physical and online one-stop access points that scale innovative services and make them available to citizens easily, reliably and in an affordable manner;
- encourage and support non-government actors, including small entrepreneurs, teachers, and youth, to partner with government actors (a2i, 2020).

Read more: https://a2i.gov.bd/about/

YPSA – Young Power in Social Action

Established in 1985 by 'socially conscious youths', YPSA is an organisation that aims to 'stop violence, and build a peaceful Bangladesh.' YPSA takes steps to prevent violence by arranging peacebuilding youth dialogues and capacity-building workshops (YPSA, 2020).

Goal of the organization: YPSA envisions a society without poverty where everyone's basic needs and rights are ensured. YPSA exists to participate with the poor and vulnerable population with all commitment to bring about their own and society's sustainable development (YPSA, 2020).

Read more: http://ypsa.org/about-us/

Partnerships

The copyright for the accessible reading materials developed for persons with print disabilities belongs to the Bangladesh Government's a2i programme and YPSA.

'a2i has been mandated to continue to bring about innovation to solve daily challenges faced by students with disabilities, while YPSA promises to continue to be involved in activities that will ease the way of quality and effective education for students with disabilities in Bangladesh. The DSS [Department of Social Services] within the Ministry of Social Welfare has been involved from the very onset of this project since the department is mandated to serve the interests of persons with disabilities. They facilitate the procurement and distribution of the materials among users within the scope of different government projects.'

~ Md. Arifur Rahman, Chief Executive, YPSA

The National Curriculum and Textbook Board (NCTB) has emerged as the key technical partner to this initiative: it has taken responsibility for updating content and distributing the materials to school-aged children.

'DAISY Consortium admires the commitment of the Bangladesh Government to provide its print disabled population with adequate learning materials. Therefore, we are happy to be involved in the ARM initiative which could be considered as a model.'

~ Dipendra Manocha, DAISY Consortium.

In the international arena, the initiative has received technical and advisory support from the DAISY Consortium and the Accessible Books Consortium of the World Intellectual Property Organization (WIPO). In addition to this, UNDP offers a2i additional financial support, complementing funding from the Bangladesh Government.

DAISY

DAISY (Digital Accessible Information System) is a technical standard for digital audiobooks, periodicals, and computerized text. DAISY is designed to be a complete audio substitute for print material and is specifically designed for use by people with print disabilities, such as blind learners, those with impaired vision, and those with dyslexia.

Based on the MP3 and XML formats, the DAISY format has advanced features such as the ability for users to search, place bookmarks, precisely navigate line by line, and regulate speaking speed without distortion. DAISY also provides aurally accessible tables, references, and additional information. As a result, DAISY allows visually impaired listeners to navigate something as complex as an encyclopedia or textbook.

DAISY multimedia can come in the form of a book, a magazine, a newspaper, a journal, computerized text, or a synchronized presentation of text and audio. It provides up to six embedded 'navigation levels' for content, including embedded objects such as images, graphics, and MathML. In the DAISY standard, navigation is enabled within a sequential and hierarchical structure consisting of (marked-up) text synchronized with audio.

Impact of COVID-19 on disability-inclusive education in Bangladesh

The COVID-19 crisis has had an enormous impact on learners' access to quality and inclusive education in Bangladesh, as it has all over the world. Children and young people with disabilities, however, have been disproportionately affected: the challenges of the pandemic have been compounded by the barriers these learners already face, such as lack of information and resources to effectively engage in academic endeavor, typical discrimination and stigma, lack of knowledge among the teachers to satisfy their curricular needs, and lack of access to learning materials or teaching (World Bank, 2020).

In an attempt to bridge the ever-widening gap between those with and without access to quality education, the Bangladesh government has implemented several initiatives to ensure accessible, equitable and quality education for students with disabilities. This has included the conversion of all Grade 1–12 textbooks through its ARM initiative, the provision

A visually impaired student is using screen reading software and a keyboard to read and navigate accessible books.

of accessible dictionaries, and the training of teachers in areas such as universal design for learning (UDL). In order to evaluate and understand these initiatives, it is necessary to examine how relevant, appropriate, and effective they have been; in particular, the role of the ARM initiative and its commitment of ensuring accessible and disability-inclusive education during the pandemic.

From 17 March 2020, all educational institutions in Bangladesh were closed, and remained so during the pandemic. The direct loss of learning opportunities caused by this was the most immediate impact of COVID-19 on the education sector, and was particularly felt by learners with disabilities. An assessment conducted by Building Resources across Communities (BRAC) revealed that 29 per cent of students with disabilities expressed fear of being excluded from educational opportunities due to the sudden change in the education delivery mechanism during the pandemic. This experience was disproportionately higher among female students (17 per cent of females and 15 per cent of males reported this) (Salam, 2020).

Disability, however, is not the only factor that has affected access to education. Families and communities living in poorly connected, rural communities faced further difficulties in ensuring access to education for children and young people: it is at the intersection of poverty, remoteness, and disability where some of the most marginalized learners are found. Factors such as limited access to education technology, little or no internet/electricity connectivity, and inaccessible remote teaching materials play major roles in the exclusion of learners at this intersection. Even where learners have access to online education, children and young people with disabilities face greater challenges in comparison with other learners. They are at risk of being left behind due of the absence of appropriate assistive equipment, low-speed internet connections, accessible reading materials, and support (UN, 2020; World Bank, 2020).

Many initiatives that are targeted towards children with disabilities have faced difficulties during the pandemic due to a lack of prior experience with accessible learning materials, assistive technologies, or remote learning. It is therefore necessary to examine and evaluate the contribution that the ARM initiative has made in regard to expanding opportunities for students with disabilities and the enhancing of quality inclusive education.

Literature review

In order to establish the current capacity of remote learning and digital learning in Bangladesh, and the effectiveness and impact of the ARM initiative in particular, a thorough review of the literature was conducted. This included policy documentation, reports, and academic literature. This review is presented below and structured under the following themes: overall prevalence of disability; prevalence of disability among children and young people; national laws and policies on disability; disability inclusion in education policies; disability inclusion in ICT policies; and background and current status of the ARM initiative. In structuring the literature review in this way, the policy climate, the current state of ICT initiatives, and the status of the ARM initiative in particular are explored.

Overall prevalence of disability

According to the Disability Information System, 1,810,821 people in Bangladesh have a disability (1,108,859 men, 699,473 women, and 2,489 who are described as third gender) (Bangladesh, 2020). However, the prevalence of disability in Bangladesh is unclear: the 2011 census reported disability prevalence to be 1.4 per cent (1.3 per cent female, 1.5 per cent male) (Disability Alliance on SDGs, 2019); however, the Household Income and Expenditure Survey, conducted the previous year – a more in-depth study following the Washington Group questions, also conducted by the Bangladesh Bureau of Statistics (BBS) – found the disability prevalence rate to be above 9 per cent (BBS, 2014). Existing data on disability or persons with disabilities are not adequate, reliable, or comprehensive. Reported data on disability rights are based on sample surveys or micro-level initiatives generally undertaken by non-government organizations (NGOs) in their working areas. The BBS and the Bangladesh Institute of Development Studies have yet to conduct any comprehensive mapping of persons with disabilities in Bangladesh (Thompson, 2020).

Prevalence of disability among children and young people

There is a lack of information regarding the prevalence of disability among children and youth in Bangladesh. According to the 2011 national census, between the age group of 0-19, approximately 3 million suffer from at least one kind of disability (Bangladesh, 2011). Children with disabilities in Bangladesh are among the most marginalized in terms of access to education. Even prior to the pandemic, while the primary school enrolment rate in Bangladesh was 97 per cent, only 11 per cent of children with disabilities received any form of education (UNICEF, 2014). Primary schools are entrusted with the responsibility of identifying children with disabilities within respective catchment areas, but there is no effective system in place for such identification, nor are identification questionnaire templates followed up regularly. Schools have little or no significant initiatives for identifying children with disabilities (Thompson, 2020).

National laws and policies on disability

Bangladesh was among the first countries to ratify and bring into force the two most significant United Nations accords that protect the rights of children with disabilities: the Convention on the Rights of the Child (CRC), in 1990, and the Convention on the Rights of Persons with Disabilities (CRPD), in 2007. The country has also taken several legislative and policy actions towards nationalizing these global commitments, including the Children Policy, adopted in 2011; a new Children Act, passed in June 2013; and the Rights and Protection of Persons with Disabilities Act 2013, which was passed in October 2013. Ratification of the CRPD enhanced a comprehensive government structure for accountability and coordination. This is reinforced by a vibrant civil society, which plays a key role in promoting human rights and equity through the provision of basic social services for children with disabilities. The government has also established a National Foundation for the Development of the Disabled Persons to provide financial support to programmes implemented by non-governmental and social organizations. As part of affirmative action, the government has also introduced a 10 per cent 'quota system' for the employment of people with disabilities in the services of the republic. A National Action Plan for issues relating to disability has also been developed (Thompson, 2020).

Disability inclusion in education policies

The Education Policy 2010 addresses children with disabilities, as does the Comprehensive Early Childhood Care and Development Policy 2013. Children with disabilities are addressed in these policies and there is an emphasis on inclusion, beginning with early learning centres/preschools and other early childhood development centres. Fewer initiatives, however, are in place for secondary school students with disabilities. The National Skills Development Policy 2012, developed with technical support from the International Labour Organization, includes the mainstreaming of disability in all governmental training programmes. The aim is to ensure reasonable accommodation and to develop disability-inclusive training modules and curricula.

Additionally, a National Strategy for Inclusion of Persons with Disabilities in Skills Development was drafted in 2013 that aims to assist in strengthening disability inclusion in the sector (Thompson, 2020). While the Ministry of Education and the Ministry of Primary and Mass Education in Bangladesh are both working to meet the goal of providing free primary and secondary education to all children by 2030, children with disabilities fall under the purview of the Ministry of Social Welfare, meaning that the educational needs of students with disabilities are effectively siloed away from those in charge of education (UNICEF, 2014). In response to concerns raised by the UN Committee on the Rights of Persons with Disabilities, the government of Bangladesh has offered affirmation that the Disability Act of 2013 guarantees the right to access to education for every person with a disability, including the right to participate in either general or special education, and prohibits discrimination based on disability status.

Disability inclusion in ICT policies

The Bangladesh Government's ICT policy has prioritized the issue of inclusion and accessibility for persons with disabilities in the service delivery mechanisms. Article 3 and strategic content 3.1.2, 3.1.3, and 3.1.8 emphasize the accessibility of services and assistive devices, while article 4 focuses on implementing ICT-based education at all levels and emphasizes access to education, materials, and mechanisms for students with special educational needs (BBS, 2018).

Background and current status of the ARM initiative

The Bangladesh Government, along with non-governmental/private organizations, provides a range of school services and inclusive education programmes for blind and partially sighted students. Although some of the organizations use audiobooks as supplementary educational materials, there are no accessible reading materials for many students with visual impairments.

YPSA (along with a2i, the Prime Minister's Office by the technical support of WIPO, Accessible Books Consortium, and the DAISY Consortium) have produced DAISY digital multimedia books, accessible e-books, and digital Braille books for learners from Grades 1 to 10. These offer a higher level of accessibility and are more cost-effective than the normal paper books that are used by students with visual disabilities, print disabilities, and learning disabilities. As part of the project, all textbooks were converted into DAISY multimedia format, which can be converted further into DAISY full text and full audio textbooks, Braille, and accessible e-books from the DAISY source files. The digital textbooks are accessible for all, including students with visual disabilities, print disabilities, and learning disabilities.

After the successful completion of 33 primary school textbooks, YPSA produced all 72 secondary school textbooks, with the support of a2i. In an initiative formally launched by the Honourable Prime Minister of Bangladesh, all students with a visual impairment in Bangladesh receive DAISY multimedia books each year. It is expected that this will increase levels of terminal competencies in users by the end of the year. A randomized controlled trial is being conducted by the Institute of Education Research of Dhaka University to measure the effectiveness of this initiative.

Thanks to this initiative, all learners can now receive equitable and quality primary and secondary education leading to relevant and effective learning outcomes (Sustainable Development Goal [SDG] Target 4.1). Furthermore, education facilities have become child, disability, and gender sensitive, and provide safe, inclusive and effective learning environments for all (SDG Target 4.a). The DAISY multimedia books have opened new avenues for students who previously faced marginalization, and allow for greater access to educational resources for all (Bhattacharjee, Hossain, and Shiblee, 2019).

Students receive an Android-based accessible reading device distributed by YPSA with the support of the ABC of WIPO.

Orientation session for students on the use of accessible reading materials.

Objectives and methodology

Objectives

This study focuses on the Bangladesh Government's ARM initiative and its effectiveness during the pandemic. The two specific objectives are:

1. To assess the role of the ARM initiative in regard to ensuring inclusive and accessible education for learners with disabilities during the COVID-19 pandemic in Bangladesh.

2. To examine the relevance and use of ICTs in different segments of the initiative, particularly during COVID-19 in terms of access to learning opportunities.

Methodology

To assess the role of the ARM initiative, its current status, effectiveness, and impact (with a particular focus on ICTs) were analysed in the context of the COVID-19 pandemic. A desk-based review of the literature, focus group discussion (FGD), and key informant interview (KII) methods were used to collect qualitative data. Data were collected from both primary and secondary sources: primary data were collected through 13 KIIs and 4 FDGs, and secondary data were collected through desk reviews of relevant documents of state and non-state offices, research organizations, relevant national and international policies and commitments, and websites of relevant ministries of the Bangladesh Government.
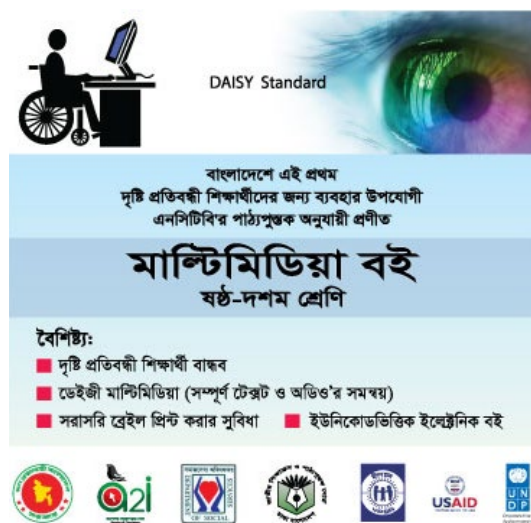
A screen of a DAISY standard multimedia talking book.
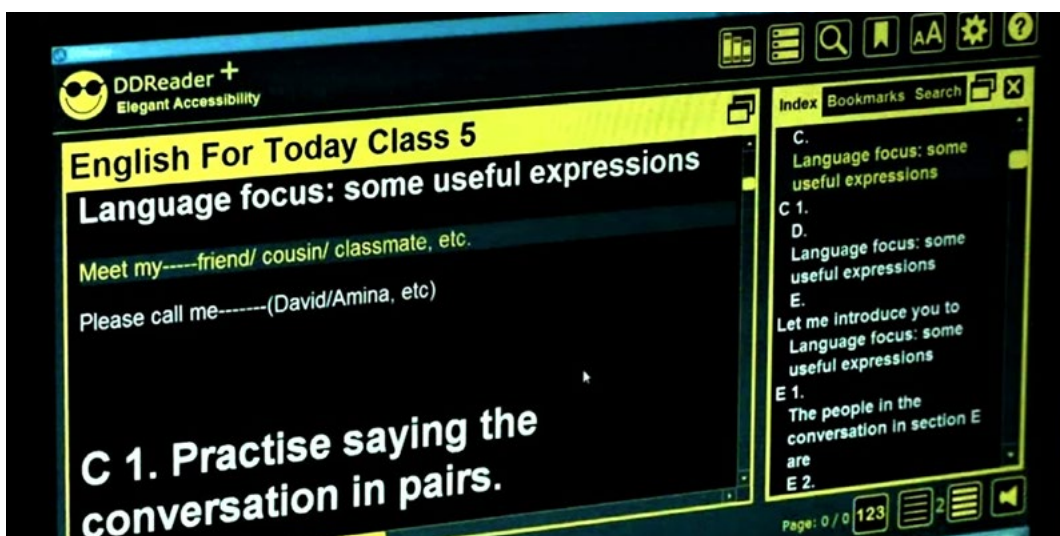
DVD cover page of mulimedia taking book, Grades 6-10.

Findings

The findings of this study are presented under the following themes: relevance and appropriateness; effectiveness; efficiency; impact; and sustainability. This section will present findings under these thematic headings.

Box 1. outlines the research questions that relate to each theme; these are included to provide the reader with context and more information on how the study was carried out.

Box 1.1 Research themes and questions

Relevance and appropriateness
- How closely aligned is the Bangladesh Government's national policy/institutional strategy and its interventions and plans with national and global goals supporting disability-inclusive COVID-19 responses?
- How aligned is the ARM initiative with its commitment of ensuring disability-inclusive education during the pandemic?
- How appropriate is the national and institutional current approach for inclusion of disabled students in formal or non-formal education?

Effectiveness
- What role did the ARM initiative play during the pandemic in ensuring accessible education for children and young people with disabilities?
- To what extent has the initiative facilitated the teaching-learning process through the use of ICTs?
- What ICTs and advanced (artificial intelligence–enhanced) ICTs/assistive devices are being used during the ARM initiative, and what are the specific objectives in mind?

Efficiency
- How efficiently have the resources dedicated to the ARM initiative been used to deliver high-quality outputs in a timely fashion, and to achieve targeted objectives?
- How efficient was the initiative during the COVID-19 pandemic?

Impact – how successful has the ARM initiative been to date, and are there signs of impact of:
- Expanding opportunities for students with disabilities?
- Increasing equitable access to quality inclusive education for children and young people with disabilities during the pandemic?

Sustainability
- What are the key features of the ARM initiative that ensure sustainability?

Relevance and appropriateness

ICTs have the potential to make significant improvements to the lives of persons with disabilities by allowing them to enhance their educational, social, cultural, political, and economic integration within communities (UNESCO, 2021; Watkins, Tokareva, and Turner, 2012). Recognising this, the Bangladesh Government has made ICTs an integral part of any disability-inclusive development agenda. In doing so, the government took into consideration the findings of different national and international data that revealed a high prevalence of disability, and subsequent illiteracy rate, in Bangladesh (Tareque, Begum, and Saito, 2014). It introduced the ARM initiative in 2014 in order to ensure accessible, equitable, and quality education for students with disabilities.

The main parties involved in the implementation of this initiative were a2i and YPSA. During the KII, representatives from both organisations affirmed their dedication and emphasized their approach regarding the involvement of persons with disabilities and organizations of persons with disabilities (OPD) throughout the initiative: the programme manager of this initiative was also a person with visual impairment, who is also the focal person for DAISY in Bangladesh.

During the preparation phase of the initiative, planning meetings were held with groups of OPDs – along with students with disabilities – in order to include their opinions and suggestions. Persons with disabilities were involved in a participatory process to identify problems. The OPD members (along with teachers with disabilities and teachers at the Government School for the Blind) interacted with the target group and collected feedback upon which the project was designed. Abdus Samad, former head teacher at the Government School for the Blind, Chittagong, and member of the expert committee of the ARM initiative mentions in this context that 'Persons with disabilities were not only involved in the planning phase, but also in every phase of the implementation stage, such as the production and dissemination of accessible reading materials, the promotion of training on the use of accessible reading materials by the students and teachers, the use of digital Braille by the Braille press and implementation, and the monitoring and evaluation of the project'.

In summary, this initiative was designed by persons with disabilities for persons with disabilities; this offers a level of validity and relevance to the ARM initiative.

'There was a need to create a solution that will be accessible for all, and satisfy the educational needs of all schoolgoing children in Bangladesh including students with visual and print disabilities all year round. So the government undertook the ARM initiative years ago which used open source technologies and the power of ICTs in line with the government's vision of creating a Digital Bangladesh. All the textbooks of class 1-12 were converted into different accessible formats such as multimedia full text, full audio, human-narrated talking books, accessible e-books, and digital Braille. After the closure of educational institutions in March 2021, everything was shifted online, and then the byproduct of the ARM initiative became a blessing for the government in ensuring inclusive and accessible education for students with disabilities during the COVID-19 pandemic'.

Dr. A K M Reazul Hassan,
Member (Primary Curriculum),
NCTB, Ministry of Education

Effectiveness

The ARM initiative appeared to be appreciated by students with disabilities during the FGD and KII. The participants expressed that, since their introduction, these books have made learning more accessible during lessons, and have continued to do so during school closures. They also agreed that with the help of these accessible books, they are now able to access textbooks at the beginning of their academic calendar – even during the pandemic. The ARM initiative has reduced their dependency on others as they can operate the books and study on their own; it also became clear that these books are encouraging many of their friends to study technical subjects, e.g., the sciences and mathematics.

Prior to the initiative, learners struggled to access textbooks (and other educational content) due to the absence of accessible study materials. These difficulties required support from their family members or friends. Md. Hassan, a government primary school teacher (who is also a person with visual disability), noted that 'prior to the pandemic, sometimes it was difficult to get accessible study materials, but after the pandemic, everything shifted towards online, accessibility got top priority, and these materials became easily available via different online platforms.' Another FGD participant, Ms Lima Akter, a student with visual disability, stated: 'When school closed, I returned to home without carrying a single printed Braille book because the books are too large to carry and I did not think that schools will remain closed for this long. Hence, I resorted to multimedia digital talking books and have been using these since through my Android phone.'

The government and its partners have distributed thousands of assistive devices such as Android smartphones, laptops, and book readers. With these, students with disabilities have been able to progress in terms of their academic studies, especially during school closures. The government and its partners (such as YPSA) have been distributing these books via the internet to students with disabilities. Indeed, one of the findings from the discussions with student and teacher groups was that these books are relatively easy to obtain; many participants mentioned that they were able to download these books from websites such as www.ypsa.org, www.abcglobalbooks.org or www.accessiblebookbd.org.

Some participants, however, expressed concern regarding the third-party distribution mechanism of accessible materials and argued that the government should create a national online accessible books library. Sajjad Hossain Saju, President, Disabled Students' Society of Chittagong University (DISSCU), stated the following: 'Government needs to create an online accessible books platform of its own or an accessible Android application from where we can get all the books whenever we need and wherever we need. Also, tertiary-level books are not fully accessible for students with disabilities.'

Although issues were raised about the accessibility of these books, it appears that, in the opinion of the focus groups and interview participants at least, the ARM initiative has been effective both in reaching marginalized learners and offering an accessible alternative to basic textbooks.

Efficiency

The Bangladesh Government has prioritized the issue of digital inclusion of persons with disabilities within its Digital Bangladesh initiative, and has undertaken several ICT-based initiatives, such as ensuring inclusive and equitable quality education for all. The ministry representatives, including the NCTB, emphasized that the production of DAISY digital multimedia talking books, accessible e-books, and digital Braille books have been popular among the beneficiary groups and are highly cost-effective compared with more inaccessible paper books.

Prior to the ARM initiative, students with disabilities (especially visually impaired students) struggled to access Braille books for their studies. These books were too heavy to carry and supply was insufficient compared to the demand. Furthermore, there was no set time in the academic year when Braille books would become available to learners. 'During the beginning of each year, we were sceptical whether we will get Braille or not. Since the accessible reading materials became available in multiple formats, this problem became our past. Even during this pandemic, as a teacher, I can assure all my students that they will get their books

on the first day of the academic year, without any delay', noted Sheuli Akhter, teacher of the Government School for the Blind in Chittagong. The ARM initiative has also proven to be efficient throughout the shift to online learning during the COVID-19 pandemic: due to their digital nature, these books are easy to distribute online, making delivery easier and safer, at least to those with access to the internet.

Students are reading Braille books in class.

Impact

In Bangladesh, a large number of visually impaired students are now studying at many levels within various educational institutions. According to the DSS, three-quarters passed the Higher Secondary Exam across the country in the last year (with 3.54 per cent achieving GPA-5, the highest score achievable). Thanks to the ARM initiative, visual impairment did not stop these students from competing with their peers and succeeding in their studies.

This success indicates that, due to the ARM initiative, students with disabilities are succeeding academically and will, in the future, be able to contribute to the national economy. The partnership with NCTB and the DSS in the Ministry of Social Welfare has enriched the ARM initiative and has taken Bangladesh a step closer to providing inclusive and equitable quality education for all. Currently, under this initiative, multimedia talking books (MTB) are also being developed for the university curriculum.

Previously, it was difficult to provide Braille books at the beginning of the year, but since forming a partnership, the NCTB and a2i have ensured that the revised multimedia talking books and Braille books – along with other

'Thanks to the ARM initiative, among the visually impaired candidates, 73.93 per cent passed and 3.54 per cent achieved GPA-5 in last year's Higher Secondary Exam.'

Md. Zulfikar Haider, Director, Operation, DSS, Ministry of Social Welfare, Government of Bangladesh.

'Leaving no one behind is the centrepiece of UNDP's approach and strategies to tackle inequality and build resilience to sustain development results. To put it in action in the education sector of Bangladesh, UNDP collaborated with the government through the a2i programme and undertook some brilliant initiatives such as ARM, accessible book reader, accessible dictionary, etc. Those innovative initiatives have been proven instrumental in realising the Bangladesh government's deep commitment of achieving the SDGs, especially the SDG 4.'

Ashekur Rahman, Assistant Resident Representative, UNDP, Bangladesh

textbooks – are available on 1 January every year for visually impaired and print-disabled students. NCTB also stated that it distributed these books among approximately 150,000 students with disabilities on the first day of the academic year. Furthermore, the a2i programme stated that its multimodel virtual educational approach during COVID-19 has incorporated the use of ARM in all its relevant segments to ensure disability inclusion and accessibility. It is estimated that approximately 70,000-100,000 students (around 10 per cent of the total viewers) with disabilities have benefited from the government's online education initiative during COVID-19 – a figure that is expected to grow in the near future. Among these students, 50 per cent were girls with disabilities.

In addition, with the support of WIPO and its Accessible Book Consortium (ABC), YPSA has distributed around 2,000 Android smartphones among the most marginalized students with disabilities (50 per cent of whom were girls). 'In collaboration with YPSA, WIPO's Accessible Books Consortium has distributed hundreds of android devices, which have proved their effectiveness during COVID 19, as students are using these devices to access different online platforms and read digitally accessible books. Likewise, during the pandemic we have noticed an increase in the number of accessible recourses downloaded from the ABC Global Book Service, from users located in Bangladesh', said Santiago Streeter of WIPO/ABC.

An accessible book reader, innovated by a2i, enhances the accessibility of content for students with disabilities. a2i has distributed around 1,200 devices (in collaboration with the National Human Rights Commission, DSS, and UNDP) among students with disabilities; these have proven to be effective in enhancing inclusive and accessible education, particularly during the COVID-19 pandemic. These devices are helping recipients to access educational and informational content, along with other online/e-services provided by governmental and private-sector organizations. During the COVID-19 pandemic, YPSA's international exchange of books from the ABC Global Book Service and Bookshare Library has increased tenfold with the organizations recording more than 5,000 book shares among the end users.

'YPSA has developed more than 200,000 pages of DAISY standard accessible reading materials for students with disabilities in the last few years which have proved to be the most effective regarding education during the COVID-19 pandemic. Since the pandemic, we have distributed these books to more than 10,000 (4,600+ were girls with disabilities) students with disabilities via email, WhatsApp, etc.'

Rashedujjaman Chowdhury, Associate Program Officer, ICT and Resource Centre for Persons with Disabilities (IRCD), YPSA

'Our multimodal education delivery mechanism during COVID-19 incorporated the use of ARM in all its relevant segments to ensure disability inclusion and accessibility, and approximately 70,000-100,000 students (around 10 per cent of the total viewers) with disabilities have benefited so far, among whom at least 50 per cent were girls with disabilities.'

Md. Afzal Hossain Sarwar, Policy Specialist and Head of Future of Education, a2i, ICT Division, Government of Bangladesh

Box 1.2 Case study of Md. Shakil Khan, a student with visual impairment

I am Md. Shakil Khan. My father, Md. Ayub Khan, is a middle-class businessman and my mother, Farzana Begum, is a housewife. I have one brother and one sister, and two of us are visually impaired. At the beginning of our student life, my sister and I had to face many adversities, but now I am studying in the first year of honors in the Department of Political Science, University of Chittagong. My younger sister, who is also visually impaired, is studying in the 10th class of Rahmania High School.

Being visually impaired, it is almost impossible for us to read regular printed books. To make the impossible possible, YPSA, with the help of a2i, published MTBs. Most of the visually impaired students like me have been relieved of the grief of not being able to read books. Now we are able to continue our studies successfully. Overall, visually impaired students are doing well. The real example of which is me. I passed the 2019 Higher Secondary Examination with GPA-5 and got admitted to the University of Chittagong.

I would like to point out more specifically that during the current Coronavirus pandemic, when all educational institutions were declared closed and when regular study became inaccessible and impossible for visually impaired students like me, accessible reading materials became the relief for my academic continuity. The television-centric education programmes have been a savior for my younger sister. Also, in 2018 I received a smartphone from YPSA which has been providing me with opportunities, especially during the pandemic, that were previously inaccessible to me.

Sustainability

The content developed under the ARM initiative is entirely digital and easily accessible through low-cost assistive devices. These books, therefore, will last and be relevant into the foreseeable future – and will continue to be when updated versions of textbooks are made available. Furthermore, as a result of the Bangladesh Government's adoption of the UN CRPD, and the introduction of its own law titled Persons with Disability Rights and Protection Act 2013 (which included a separate section on ICT and accessibility, national ICT policy, and the Right to Information Act), issues of accessibility in the education sector are gaining priority: the government has affirmed that it will support the production of accessible books (Article 19, 2015).

'Since Bangladesh is transforming into a digital Bangladesh, it was a mandate of the government to ensure equal access for all in the service and education sector; hence, through the ARM initiative, the government has reaffirmed that it will support the production of accessible books for making education inclusive and barrier-free for all including students with disabilities', said Faruque Ahmed, Consultant (Academic Research, Development and ICT), Primary Education Development Programme 4, Government of Bangladesh.

'The ratification of the Marrakesh Treaty, and the amendment of the existing copyright law, still remained as a huge barrier for accessible book production'.

Monsur Ahmed Chowdhury, Founder/ President, Bangladesh Visually Impaired Peoples Society (BVPIS), and former Member of the Monitoring Committee, CRPD

As a result, after amending the act and including Braille production issues in its mandate, the NCTB now publishes accessible books on a yearly basis. The ownership fostered by NCTB will ensure that whenever there is any modification to the national curriculum, it will be integrated into the accessible reading materials, ensuring that updated content is available to students with or without disabilities. Furthermore, due to the use of open source technology, the process of developing and producing the full-text and full-audio multimedia books, Braille books, and accessible e-books through the use of DAISY is easily replicable (Bhattacharjee, Hossain, and Shiblee, 2019). However, in order to attain maximum leverage from this innovation, it is necessary

to continuously implement innovations that complement the overall learning environment for students with disabilities. The future of this initiative lies in making it independent of hardware type, and user-friendly for students of any level of education.

One factor that has the potential to enhance the sustainability of this initiative is the ratification of the Marrakesh Treaty (WIPO, 2016). This would allow for copyright exceptions to facilitate the creation of accessible versions of books and other copyrighted works for print-disabled students.

Other factors

In addition to the key themes, other factors relating to the ARM initiative were raised during this study. These include the move from CDs/DVDs to accessible book readers, the coverage of key subjects, accessibility for students in higher education, and the awards won.

Any students with access to computers, tablets, or Android mobiles can use the materials created under the ARM initiative. Visually impaired students can participate in learning by listening to content that has been designed to make learning easy and engaging. These books were initially developed in the form of CDs/DVDs which required a laptop or computer to run. To address this dependency on computers, a portable DAISY-supported accessible book reader was also developed for playing these books. It has been designed in a way that will provide complete subtitles, along with audio subtitles for printed materials, and is specifically designed to be used by students with print disabilities, including blindness, impaired vision, and dyslexia.

The ARM initiative has already encompassed all textbooks for Grades 1–12, and works alongside all other existing DAISY-supported/ePub books. It also uses several other open source technologies. Therefore, it is able to cover key subjects such as science, English, literature, Bangla, history, geography, social science, and religion of the NCTB.

'Before the ARM initiative, it was difficult to create an accessible lecture as there was no Unicode text except colonial fonts. Now that the ARM has used several open source technologies, it became much easier for me to engage with my students who have disabilities. It is easier for the teachers now to prepare lectures in accessible formats which has especially proven its effectiveness during the pandemic when everything moved to online'.

Mohammad Kabir Hossain, Associate Professor, Government Teachers' Training College, Comilla.

This project has developed more than 100 university books and is working to increase this number. In order to establish an accessible inclusive education, especially during emergencies such as the COVID-19 pandemic, DAISY-standard accessible reading materials, created under the Bangladesh Government's ARM initiative, have played a vital role.

This initiative, and its pioneers, have received several international awards thanks to its innovation and effectiveness. These have included the UNESCO Prize for Digital Empowerment of Persons with Disabilities in 2018, the World Summit on the Information Society Prize in 2017, the Accessible Books Consortium Award for Accessible Publishing Initiative at the International Excellence Award in 2015, and the Information Society Innovation Fund (ISIF Asia) award in 2014 (Bhattacharjee, Hossain and Shiblee, 2019).

Barriers encountered with the ARM initiative

During the KIIs and FGDs, the participants pointed out several barriers that they encountered regarding the implementation of the ARM initiative and using the books created under the ARM initiative. They are being presented in the following two segments. Participants also shared obstacles that they faced regarding the COVID-19 pandemic.

Common barriers:

1 Lack of high-quality text-to-speech software in the Bangla language.

2 Lack of Unicode text.

3 Absence of copyright exception in the copyright law for the production of accessible reading materials in the country.

4 Lack of established library service or effective online mechanism for distribution of accessible reading materials.

5 Lack of awareness on accessible digital contents.

6 Lack of motivation among the teachers to use DAISY books.

7 Scarcity of low-cost playback devices for accessible reading materials.

Barriers specific to COVID-19:

1 Lack of collaborative response to mitigate the inclusive educational challenges posed by COVID-19.

2 The stigma attached to using assistive technologies and online mechanisms in the education sector in Bangladesh.

3 Confusion about the changes in education delivery and assessment approaches driven by the pandemic.

Recommendations

- Conduct a dedicated in-depth national survey to find out the exact prevalence of children and youth with disabilities and their needs.

- Make all accessible reading materials available through a national online accessible books platform, as well as through an accessible Android application.

- To provide access for students with all types of disabilities; all government e-learning platforms should be made inclusive and accessible.

- Ratify the Marrakesh Treaty urgently; the treaty will allow for copyright exceptions to facilitate the creation of accessible versions of books and other copyrighted works for print-disabled students.

- Include sign language in the government's multimodal approach and promote the use of sign language in all levels of education.

- Set up specific plans for the return to school, with clear measures for children with disabilities. Ensure that information and instructions regarding the return to school (and social distancing measures) are provided in multiple, accessible formats.

- Changes in the education delivery system due to the COVID-19 crisis should be institutionalized in policy.

- Initiate inclusive policy reforms to improve the quality of education for children with disabilities in consultation with representative organizations of children and youth with disabilities and their parents. Ensure that policy reform addresses key enablers of inclusive education, such as appropriate investment in teachers; inaccessibility of learning materials, methods and environment; and reasonable accommodation provision.

- Ensure that all learning materials prepared for the return to school are accessible, and that consultation with children with disabilities and their families is made mandatory on any curricular or assessment changes.

- Provide additional training and support to teachers and aides who teach and support children with disabilities.

- Scale up the current innovations such as MTBs, accessible e-books and accessible book readers.

Conclusion

In Bangladesh, education pathways and curriculum delivery have traditionally been generic and linear, with little flexibility to respond to individual student needs. With the aim to build a nation and a workforce ready to contribute to the 21st century, the Government of Bangladesh introduced ICTs into many aspects of education; the ARM initiative is one introduction, among others (see below), that has opened new avenues for students with disabilities to harness resources and continue learning, even when schools closed at the beginning of 2020.

When the COVID-19 pandemic hit Bangladesh, the government was forced to identify new, innovative, inclusive, and accessible ways to provide students with learning opportunities. The ARM initiative has proven to be effective in this regard by ensuring inclusive and accessible education for students with disabilities, and has contributed to a narrowing of the 'digital divide'. It is necessary, however, to maintain levels of support and to ensure that students have more, and better, opportunities to learn in the post-pandemic era. To this end, policy reform must be pursued to ensure that remote learning options are maintained – that these options are not only implemented in times of emergency, but are in place to provide continuous support and remedial learning options for both classroom-based and home-based learners, with and without disabilities. If this support is provided in a sustainable and impactful manner, then – and only then – will the ARM initiative reach its full potential. If delivered, and maintained, effectively, this 'model of good practice' will not only benefit the millions of learners with and without disabilities within Bangladesh, but will act as an example that the Global South can follow. The impactful and effective ARM initiative, co-designed with persons with disabilities, will provide a strong model for others to work from and, in turn, may benefit countless learners around the world.

Other initiatives that complement ARM

The ARM initiative is one of many ICT-based programmes that have allowed learning to continue during periods of school closures. Below, five others are listed. These are not 'competing' initiatives; each complements all of the others. This multilateral approach allows more learners to be reached by a greater number of initiatives, depending on their location, their access to technology and the internet, and their particular learning needs.

Education through TV broadcast (Sangsad+EduSkills)

Since national school closures, the state-run Sangsad Bangladesh Television has been broadcasting pre-recorded lessons for primary, secondary, madrasah, and technical students under the supervision of respective directorates (and with technical help from a2i). As of December 2020, a total of 501 classes for primary students, 1,260 classes for secondary students, 260 classes for madrasah students, and 140 classes for technical students were telecast. These classes have been viewed by around 3.5 million students daily. The classes were based on the annual lesson plan and students were given regular homework, as they would receive from school-based classed. The first class was aired on 29 March 2020 for secondary students. Later classes for primary, technical, and madrasah students started from 7 April, 19 April, and 5 May, respectively (a2i, 2020).

Purpose
- academic classes for students
- live sessions for students, parents, and teachers (proposed).

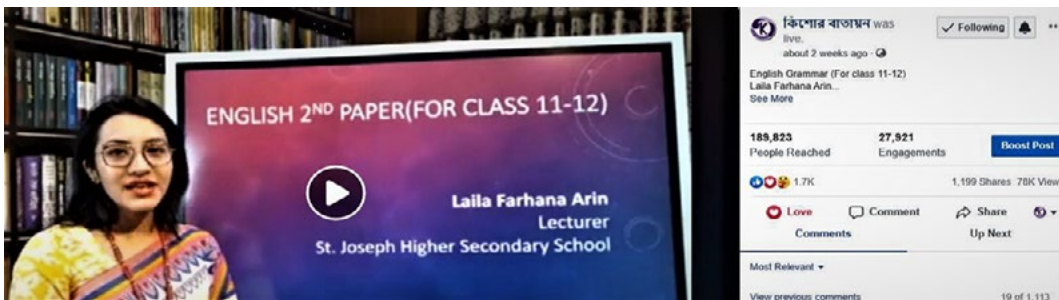**First TV broadcast on 29 March 2020**

So far...

2,100+
Classes broadcast

13.6 million
Students reached

3,500 classes
Target to broadcast by December 2020

A class using Facebook Live during the COVID-19 pandemic.

Education through social media (Facebook Live and YouTube)

During the pandemic, social media have been an important platform for internet-based educational content delivery (Sobaih, Hasanein, and Abu Elnasr, 2020). Alongside television broadcasts, many Facebook pages and YouTube channels aired online classes for pre-primary to Grade 12 students.

A Facebook page named Ghore Boshe Shikhi, owned by the Directorate of Primary Education (DPE) and run by a2i, aired more than 2,200 classes and had 10 million views in total. An a2i specialized platform for adolescents, Konnect Kishore Batayon, aired 378 classes for college students which had around 1.7 million views daily. According to a2i's Teachers' Portal online class dashboard, as of March 2021, roughly 268,000 classes were taken by more than 14,000 teachers from over 5,400 Facebook pages. Online classes were also broadcast from the Konnect YouTube channel, which has around 87,000 subscribers. In addition to academic classes, the Konnect Facebook page also aired numerous classes on 'soft skills', such as painting, web development, film-making, and game design. The Konnect online counselling session on mental health and well-being, which was available through the same platform, was also widely viewed (a2i, 2020).

Purpose

- online classes for students
- additional support for students, parents, and teachers.

So far...

90,000+
Classes

1.0 million
Students per day

1.5 million students
Target to reach per day by December 2020

'After the countrywide lockdown, all the educational institutions were closed and everything shifted online. Then the reading materials created under the ARM initiative became handy to continue the online education delivery for ensuring inclusive and accessible education for students with disabilities'.

Selina Islam, Deputy Director (Monitoring), Directorate of Secondary and Higher Secondary Education, Ministry of Education

Implementing agencies

Ministry of Education, Ministry of Primary and Mass Education, Directorate of Secondary and Higher Education, Directorate of Primary Education, Directorate of Technical Education, Directorate of Madrasha Education, National Academy of Primary Education, National Curriculum and Textbook Board, Bangladesh Technical Education Board, Bangladesh Madrasah Education Board, a2i Programme, ICT Division (through a2i official facebook page, Konnect – Kishore Batayon Facebook Page and Youtube Channel, Teachers' Portal Facebook Page, Skills Portal Facebook Page and Youtube Channel, Imam Portal Facebook Page and Youtube Channel) with financial support from UNICEF.

Community radio–based classes

The state-run radio station Bangladesh Betar has been broadcasting classes for primary students, alongside Sangsad Bangladesh Television, as educational institutions remained closed due to the COVID-19 pandemic. Classes have been aired through Bangladesh Betar and 16 community radio stations simultaneously, from Sunday to Thursday from 4:05 p.m. to 4:45 p.m. Students can join these classes through radios or mobile phones. In addition, the a2i programme has conducted over 200 interactive radio classes with the help of teachers from the Directorate of Technical Education, along with support from UNICEF, and have been able to reach millions of students (Bangladesh National Portal, 2020).

Purpose
- academic content for different classes
- live sessions with teachers
- public service announcements for educational awareness.

So far...

450+
classes for primary
and 200+ classes
for technical

500,000
Students
per day

600,000+ students
Target to reach per day
by December 2020

Implementing agencies

Primary agencies: Ministry of Primary and Mass Education, Directorate of Primary Education, National Academy of Primary Education and National Curriculum and Textbook Board with the financial support of UNICEF and Bangladesh Betar as broadcasting partner.

Technical agencies: Implemented by Ministry of Education, Directorate of Technical Education, and Bangladesh Technical Education Board with financial support of UNICEF and Bangladesh Betar as broadcasting partner.

MuktoPaath e-learning platform

MuktoPaath has created opportunities for general, vocational, and lifelong education for many learners, including those with disabilities. Disadvantaged and marginalized groups are able to receive vocational education on MuktoPaath that relates to and is beneficial in terms of self-employment. Teachers, students, youths, working people, outbound workers, migrant workers, or housewives, for example, are able to learn with MuktoPaath. Currently, MuktoPaath has 1.1 million registered learners and offers more than 187 courses. During the pandemic, MuktoPaath played a significant role as a first-hand responder in the health and education sector. MuktoPaath provides 10 COVID-focused e-learning courses for doctors, health professionals, and teachers in collaboration with governmental and non-governmental organizations, such as the Directorate General of Health Services, Bangabandhu Sheikh Mujib Medical University, DPE, the Directorate of Secondary and Higher Education, BRAC, and John Hopkins University and trained around 50,000 doctors, 100,000 health professionals, and 300,000 teachers (a2i, 2020).

Purpose

- providing e-learning facilities for learners.

So far...

180+ Courses
    1 million Learners
    100 Partners

ফিচার কোর্সসমূহ

COMPREHENSIVE TRAINING COURSE ON COVID-19 FOR DOCTORS ★★★★★	★★★★★	উ-১৯ প্রতিরোধে ★★★★★	brac ★★★★★	★★★★★
কোভিড-১৯ বিষয়ক কম্প্রিহেনসিভ ট্রেনিং কোর্স: 🏛 স্বাস্থ্য অধিদপ্তর, বিএসএমএমইউ, ইউএসএআইডি, জন হপকিন্স সিসিপি ⏱ ২ ঘন্টা 👥 (11.4k) বিনামূল্য	চিকিৎসকদের জন্য কোভিড-১৯ বিষয়ক উচ্চতর প্রশিক্ষণ 🏛 স্বাস্থ্য অধিদপ্তর (DGHS) ⏱ ২ ঘন্টা 👥 (3.5k) বিনামূল্য	কোভিড-১৯ প্রতিরোধে বেসরকারি স্বাস্থ্যকর্মীদের জন্য 🏛 Jeeon ⏱ ১ ঘন্টা 👥 (51.6k) বিনামূল্য	কোভিড-১৯ সচেতনতা ও প্রতিকার 🏛 ব্র্যাক ⏱ ১ ঘন্টা 👥 (120.8k) বিনামূল্য	করোনাভাইরাস (কোভিড-১৯) বিষয়ক অনলাইন কোর্স 🏛 স্বাস্থ্য অধিদপ্তর (DGHS) ⏱ ১ ঘন্টা 👥 (161.3k) বিনামূল্য

A screen shot of the MuktoPaath e-learning platform.

Implementing agencies

a2i Programme, ICT Division, Cabinet Division and UNDP Bangladesh with 100+ government and non-government partners.

Emporia web platform and mobile application

The Emporia application is composed of a web platform and a mobile application. The web platform provides access to an e-learning platform and job portal specifically designed for persons with disabilities. Users of the mobile application need to download the mobile application on an Android mobile device.

Emporia includes ICT courses and a 'dynamic exam' system. The job portal allows persons with disabilities easier access to jobs and a simpler way to apply for positions.

The app features:
- dynamic responses, depending on type of disability
- the ability for users to complete their e-learning course both in online or offline mode
- the opportunity for learners to map their progress, retake exams, or comment/rate particular courses
- the ability for users to build a CV and to search and apply for jobs (Emporia, 2021).

Purpose

·   e-learning and job portal for persons with disabilities. https://emporia.bcc.gov.bd/

Implementing agencies

Digital Bangladesh, ICT Division, genweb2, Bangladesh Computer Council.

Screenshots from the Emporia application.

A screen shot of the Emporia web platform (desktop).

Empowerment of Persons with Disabilities including NDD [Neurodevelopmental Disabilities] through ICT

This project aims to help persons with disabilities develop ICT skills that will promote their employment and allow them to contribute to a Digital Bangladesh. The specific goals are:

- to produce specialized audio and video tutorials on ICT training with voice and sign language help
- to develop a specialized, interactive, accessible national e-learning platform (web portal) for persons with disabilities
- to establish a specialized ICT Resource Centre for persons with disabilities
- to popularize ICTs among persons with disabilities (Emporia, 2021).

Purpose

- to help persons with disabilities develop ICT skills and become skilled employees (EPWDICT, 2020).

Implementing agency

Bangladesh Computer Council

Synchronous learning management system (LMS) for tertiary education and training

On 23 June 2020, under the leadership of the Ministry of Education, the University Grant Commission (UGC) and a2i, the ICT Division developed a virtual platform allowing for the organization of different types of live classes and training sessions. For video conferencing, a range of software is being used (WebEx, Google meet, and other video conferencing software along with Muktoclass conferencing software). Different types of multimedia and audio-visual content in different formats (pdf, PowerPoint etc.) can be shared as attachments.

Purpose

- to provide greater access to learning opportunities during the pandemic and beyond (https://www.virtualclass.gov.bd/)

So far...

47	5900+	570+	2850+
Institutes reached (34 universities/colleges and 13 training institute)	Learners reached	Learners reached	Virtual classes organized

(a2i, 2020).

Implementing agencies

Ministry of Education, University Grant Commission (UGC), a2i, ICT Division.

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Glossary

1. **Accessible reading materials** are print- and technology-based readings and core materials that are designed or converted in a way that makes them usable across the widest range of user needs.

2. **Information and communication technology (ICT)** is a broader term for information technology, and refers to all communication technologies, including the internet, wireless networks, cell phones, computers, software, middleware, videoconferencing, social networking, and other media applications and services.

3. **Inclusive education** means all children in the same classrooms, in the same schools. It means real learning opportunities for groups who have traditionally been excluded – not only children with disabilities but also, for example, speakers of minority languages.

4. **The Marrakesh Treaty** was adopted on 27 June 2013, in Marrakesh and it forms part of the body of international copyright treaties administered by WIPO. It has a clear humanitarian and social development dimension and its main goal is to create a set of mandatory limitations and exceptions for the benefit of the blind, visually impaired, and otherwise print disabled.

5. **Remote learning** occurs when the learner and instructor, or source of information, are separated by time and distance and therefore cannot meet in a traditional classroom setting.

6. **Universal design for learning (UDL)** is an approach that acknowledges that in a classroom of learners, all are different. They understand, process, and express things differently from one to the next. UDL asserts that teaching and learning should utilize a multitude of methods to support all learners, including, but not limited to, learners with disabilities. UDL involves three key principles of teaching so that it provides multiple means of: 1) engagement, by helping students stay motivated to learn through a variety of methods; 2) representation, by having content presented in a variety of ways; and 3) action and expression, by having students show what they have learned in a variety of ways. By employing various means of these three principles, learning achievement for all students is improved.

7. **Unicode** is a universal character encoding standard that assigns a code to every character and symbol in every language in the world. Since no other encoding standard supports all languages, Unicode is the only encoding standard that ensures that you can retrieve or combine data using any combination of languages.

Appendices

Appendix 1. Documents reviewed

1. Bangladesh Preparedness and Response Plan for COVID-19.

2. United Nations Convention on the Rights of Persons with Disabilities.

3. The Persons with Disabilities Rights and Protection Act 2013.

4. National Education Policy 2010 of Bangladesh Government.

5. National ICT Policy 2018 of Bangladesh Government.

6. Eight Five-Year Plan, General Economics Division, Bangladesh Planning Commission, Government of Bangladesh.

7. Prospects and Challenges of Distance Learning During COVID 19 Pandemic, Campaign for Popular Education (CAMPE), Bangladesh 2020.

8. Online Educational Activities, a2i, ICT Division, Government of Bangladesh.

9. 'Ensuring an inclusive return to school for children with disabilities', UNICEF East Asia and Pacific Region COVID-19 Technical Guidance.

10. International Telecommunication Union Guidelines, 'On how to ensure that digital information, services and products are accessible by all people, including persons with disabilities during COVID-19'.

11. Bangladesh Situational Analysis by the Institute of Development Studies.

12. 'Pivoting to inclusion: Leveraging lessons from the COVID-19 crisis for learners with disabilities', issues paper by World Bank Group.

13. Situation analysis on children with disabilities in Bangladesh by UNICEF Bangladesh.

Appendix 2. Organizations consulted for the research

Direct involvement of organizations of persons with disabilities:

1. BVPIS (Bangladesh Visually Impaired People's Society)

2. DISSCU (Disabled Students' Society of Chittagong University)

3. Disabled Development and Research Center–DDRC

4. Disabled Welfare Association

5. IRCD (ICT and Resource Centre for Persons with Disabilities)

NGOs working for persons with disabilities whose representatives were involved:

1. CSID (Centre for Services and Information on Disability)

2. CDD (Centre for Disability in Development)

Appendix 3. Participants – Key informant interviews and focus group discussions

Table 1: List of KII participants

Participants		Number of KIIs
Key official of relevant ministries	Position: Member (Primary Curriculum) Organization: NCTB, Ministry of Education. Deputy Director (Monitoring) Directorate of Secondary and Higher Education Ministry of Education	2
	Position: Director, Operation. Organization: DSS, Ministry of Social Welfare	1
	Position: Policy Specialist and Head of Future of Education Organization: a2i, ICT Division.	1
Representative of development partner (international)	Position: Director at Developing Countries Program Organization: DAISY Consortium	1
	Position: Assistant Resident Representative Organization: UNDP, Bangladesh	1
	Position: Capacity Building Consultant Organization: ABC of WIPO	1
Representative of development partner (national) Position: Chief Executive Organization: YPSA		1
Researcher Position: Consultant, Academic Research, Development and ICT Organization: Primary Education Development Programme 4		1
Representative of disabled people's organization) Position: Founder President Organization: BVPIS, and Former Member of the Monitoring Committee, CRPD		1
Representative of teachers Position: Associate Professor, Bangladesh Civil Service (General Education) Organization: Government Teachers' Training College, Comilla		1
Representative of parents Address: Hamzerbag, Muadpur, Chittagong Other details: Mother of a visually impaired student (Shakil) who got a GPA-5 in the last secondary school certification examination		1
Representative of students Class: Honours final year Institution: University of Chittagong Position: President Organization: DISSCU		1
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Table 2: List of FGD participants

Relevant stakeholders			Number of FGDs
OPDs, NGOs and international NGOs			1
Country Operational Coordinator, Humanity and Inclusion	Coordinator, BVPIS	Executive Director, Disabled Development and Research Center- DDRC	
Executive Director, Centre for Services and Information Disability.	Founder and Executive Director, Disabled Welfare	Thematic expert, Inclusive Education, Centre for Disability in Development	
Coordinator, Manusher Jonno Foundation	Associate Programme Officer, IRCD of YPSA		
Teachers			1
Mohsena Model Government Primary School, Patiya, Chittagong	Surikora, Gonoboti, Government Primary School, Choddogram, Comilla		
Nasirabad Government Girls' High School, Chittagong	Government School for the Blind, Chittagong.		
Government Visually Impaired School, PHT Centre, Mirpur, Dhaka	North Rangcharpra Government Primary School, Valuka, Mymensingh		
Barishal Primary School, Shilong, Barishal	Temuria Government Primary School, Murad Nagar, Comilla		
Manob Kollan Trust School, Pabna			
Parents and Caregivers			1
Address: Sunnia Madrasa, Muradpur Chittagong	Address: Shantirhat Patiya, Chittagong		
Address: Oxygen Shitol Jharna, Chittagong	Address: Mohammadpur 124, Chittagong		
Address: Madam Bibirhat, Sitakund, Chittagong	Address: Chandonaish, Chittagong		
Address: Ujirpara, Patiya, Chittagong	Address: Dhaka		
Students			1
Class: 12 Institution: Government City College	Class: 10 Institution: Rohmania School		
Class: 2nd year Institution: Dhaka University	Class: 12 Institution: Government City College		
Class: 12 Institution: Hajeratun Degree College	Class: 12 Institution: Hajeratun Degree College		
Class: 1st year Institution: Chittagong University	Class: 9 Institution: Rahmaniya Girls School		

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About the authors

Vashkar Bhattacharjee, a person with a visual disability, is currently serving as the National Consultant for Accessibility in the a2i Program of the ICT Division of the Bangladesh Government. He is also serving as the disability focal point and is looking after the disability portfolio of YPSA. His current focus is on bringing innovation in inclusive education, including the creation of accessible reading materials, facilitating the government's inclusive university initiative and e-learning for persons with disabilities. He is also the focal person in Bangladesh for DAISY, ABC, Bookshare and Federation of DPO's Sitakund, and is working as the country representative of G3ict. Vashkar is the first Bangladeshi to receive the UNESCO Emir Jaber Prize for Digital Empowerment of Persons with Disabilities (2018/2019). He has also received the Henry Viscardi Achievement Award in 2017 and Bangladesh's honorable Prime Minister's award as a successful person with a disability in 2016.

Shahriar Mohammad Shiblee is currently serving as the research and documentation officer at YPSA. Since the beginning of his career, he has been working on issues and challenges around disability and, especially, on the issues of accessible and inclusive education and relevant training facilities. He has ten years of experience in the art and cultural sector. Shahriar is the recipient of the ICCR scholarship (2014) and the West Bengal Showvik award of honour (2015).