

WORKING PAPER

Integration of Technology in Education for Marginalised Children in an Urban Slum of Dhaka City During the Covid-19 Pandemic

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Abbreviations and acronyms

BSSRP	Bangladesh Covid-19 School Sector Response Project
BDT	Bangladeshi Taka
ICT	Information Communication Technology
MoE	Ministry of Education
NGO	Non-governmental organisation
SMS	Short Message Service
UNICEF	United Nations Children's Emergency Fund

Executive summary

In March 2020, the Covid-19 pandemic forced a shutdown of all schools in Bangladesh, which remained closed until September 2021. This shutdown marked the world's second-longest school closure due to Covid-19, affecting 40 million learners from pre-primary to the tertiary levels of education ([UNICEF, 2021](#)). For most learners, the shutdown of schools meant a shift from in-person schooling to remote learning aided by the use of technological devices. The Bangladesh Covid-19 School Sector Response Project (BSSRP) set out the Government of Bangladesh's plan to help mitigate the disruption of school closures. This plan included a multi-modal approach intended to reach as many learners affected by the school closures as possible ([Sarwar et al., 2020](#)).

However, BSSRP failed to adequately reach all learners, particularly those living in the most marginalised contexts. Marginalised learners include those living in urban slums who, prior to the Covid-19 pandemic, experienced considerably poorer education outcomes compared to the national average. Enrolment levels among this group of learners were found to be significantly lower, and dropouts significantly higher, compared to the national average ([Khondoker, 2020](#)). While global evidence from the Covid-19 period indicates that the most marginalised learners have been the most negatively affected by interruptions in their schooling, relatively little is known about the impact that Covid-19 has had on the education of children living in Bangladesh's urban slums.

This study focuses on Korail, which is one of the largest slums in Dhaka and is located between the two affluent residential areas of Gulshan and Banani. We surveyed 476 students in Years 6 to 10, who were enrolled in secondary school prior to the Covid-19 pandemic. The survey was designed to obtain a picture regarding the state of technology ownership among Korail households, and the extent to which devices were utilised to help preserve learning continuity during the pandemic. The survey was also intended to probe what factors influenced student access to and use of technology.

This study sought to answer two research questions:

- (i) What is the current state of children's educational technological devices in Korail slum to participate in education?
- (ii) What are some of the underlying factors influencing the access children have to these devices?

The survey data produced the following key findings.

Device ownership

Device ownership among households in Korail was higher than the national average, with 78% of households owning at least one smartphone (national average: 41%). Similarly, 85% of households owned a television (national average: 47%). Almost half of surveyed students utilised technology to continue their education, with the most common devices being the smartphone (73%), followed by television (20%).

Access to devices

Access to devices / internet to participate in online classes appeared to favour boys and students in higher grades. Male survey respondents had greater access to technological devices (56%) compared to female respondents (44%). Students attending madrasahs or private schools were less likely to attend physical or online classes during the pandemic: 75% of all learners who had attended a government school and 80% of learners who had attended a school supported by a non-governmental organisation (NGO) prior to the Covid-19 pandemic were able to continue with their education through online or physical classes. This number fell to 55% for students attending madrasah institutions, and 61% for those attending private schools.

Reasons for inability to participate in online classes

Aside from access issues, a number of reasons were identified regarding why students were unable to participate in online classes. These included: parents' lack of trust or permission regarding device usage (21%), lack of technical know-how (8%), and lack of interest on the part of the student (14%). In addition, some educational institutions did not offer any tech-based online education (28%). For instance, there was great variation in what different types of educational institutions were offering. Whereas for government schools and NGO schools this was 75% and 70% respectively, for semi-government schools the equivalent was 56%, and for private schools, it was 14%. Madrasahs in Korail did not offer any tech-based online classes.

These findings resulted in the following key policy recommendations.

Raising awareness around the importance of digital solutions and their potential role in assisting with learning

Beyond physical access, a lack of parental willingness to allow students to use devices explaining why learners were unable to access learning through the use of technology was a core finding of this research. Any programme using technology as a medium of instruction must raise awareness of parents and

also teachers and students about what technology's potential role is when it comes to learning.

Supporting the effective use of existing technologies and infrastructure by taking into account learner preferences

Television, while owned by the majority of the households surveyed, was comparatively much less well-utilised for education continuity compared to smartphones. More research is needed to better understand why this was and how television as a device, can increase its potential in reaching more children. Part of this can involve actively including the end-user — in this case, the student — in the design of any programmes that involve television. Such an approach would seek to include in the design of any programme an understanding of how to meet user needs.

Determining the dynamics, which, at the household and community level, affect access to technology for certain groups of learners

Girls and learners studying in lower grades were found to have less access to technology compared to boys and older learners. Understanding what accounts for this, and whether this is uniform across different types of technological devices will be important for policymakers to consider. With technology becoming an integral part of education systems worldwide, including in Bangladesh, policymakers must ensure that this does not set back girls' progress in accessing education.

1. Introduction

1.1. Background to the study

Education is a fundamental right for all humans irrespective of their socio-economic status, gender, race, nationality, ethnicity, religion, or political preferences. Unfortunately, various unavoidable factors continue to hinder access to education for many children, especially those who are marginalised. Although technological advances through platforms such as Zoom, Google Meet and other social media platforms have expanded access to education for many children around the world, those in marginalised communities continue to face barriers to access to education due to limited or no access to such technologies.

Over the last 10–12 years, Bangladesh has made significant progress in ensuring that children are able to access education. In 2007, Bangladesh had 6.3 million students enrolled at the secondary level (Years 6–10); in 2019, this number had climbed to 8.3 million ([↑World Bank, no date](#)). Despite improvements in access, the quality of schooling in Bangladesh is an area of concern. More than half (58%) of students completing Year 5 still failed to achieve minimum reading proficiency ([↑Rahman & Ahmed, 2021](#)). One key reason for this relates to students' socio-economic situations, with parents' lack of financial resources and inability to assist with schoolwork contributing to higher rates of absenteeism and dropout rates among learners from poorer households ([↑Sabatés et al., 2013](#)). This disparity has been further exacerbated by the Covid-19 pandemic, which forced educational institutions to close to face-to-face instruction in mid-March 2020 before reopening again in September 2021.

Even prior to Covid-19, the Government of Bangladesh undertook initiatives to integrate digital technology within the education system. These efforts included: establishing computer labs with high-speed internet access within all educational institutions; using digital equipment to create multimedia classrooms; harnessing technology to enable peer and collaborative learning between the students and teachers; providing all teachers (from all levels and systems) with training on how to take classes using digital equipment; and developing interactive e-books, digital resources, and e-learning content using a central e-learning platform ([↑Government of Bangladesh, 2018](#)).

Specifically, in relation to the Covid-19 period, in order to mitigate the negative impacts of the school closures, the Government of Bangladesh began offering education through four working platforms. This included an electronic media platform, a mobile platform, a radio platform, and an internet platform. The

first programme by Sangsad Bangladesh, a government-owned TV channel, for secondary level students, 'Ghore Bose Shikhi' (Learning from Home), was initially broadcast on 29 March 2020 ([↑Ministry of Primary and Mass Education, 2020](#)). This provided students with ten 20-minute classes per day, along with technical courses and madrasah-based education ([↑Ministry of Primary and Mass Education, 2020](#)). The Ministry of Primary and Mass Education (MoPME) and Ministry of Education (MoE), in association with 'Access to Information' (a2i), have also explored the potential of other remote-learning platforms for reaching all children, including radio (national, FM, community) and mobile phones (feature and smartphones) ([↑Ministry of Primary and Mass Education, 2020](#)). This shift from in-person learning at schools to technology-based learning from home represented a quick, yet temporary transformation in the education system.

Although distance learning from home replaced in-person schooling during the pandemic, not all students had equal access to the devices required for learning continuity (e.g., television, mobile phone, radio, etc.). This disparity created a 'digital divide'¹ whereby access to education was significantly lower among students with limited or no access to learning technologies ([↑Rahman & Ahmed, 2021](#)). The digital divide was largely correlated to socio-economic status. As an example, 91% of the wealthiest families in Bangladesh reported having access to television compared to 9.2% of the poorest families ([↑Rahman & Ahmed, 2021](#)).

The aforementioned digital divide exists at three different levels:

1. physical access to devices;
2. quality of access and mobile data price;
3. a utility gap caused by the inability to access available technology needed for e-learning ([↑Badiuzzaman et al., 2021](#)).

In one study, for example, 123 students from four different geographic regions who had access to smartphones reported being unable to attend online classes due to weak mobile signals in both rural (47%) and urban (35%) areas ([↑Badiuzzaman et al., 2021](#)). Insufficient infrastructure to support a mobile network, poor internet quality, and high costs were identified by students as the most significant barriers to accessing learning remotely. Moreover, and perhaps most significantly, the disparity in accessing the strong signal needed to access certain technologies contributed to the learning gap between rural and urban areas. These factors have all meant that the time that rural students

¹ A 'disparity' in accessing information and communication technology (ICT) generally is defined as a digital divide ([↑Badiuzzaman et al., 2021](#)).

spend studying each day has been reduced, from 10 hours prior to the pandemic to two hours at present ([↑Asadullah, 2020](#)).

The pandemic has also highlighted the challenges faced by families living in poverty, with low-income families being forced to cut their spending on food items by 30% and non-food items by 63% ([↑SANEM, 2021](#)). As such, spending on education has also significantly been reduced for such households ([↑SANEM, 2021](#)). Children living in Bangladesh's slums have been negatively affected with respect to accessing tech-based education during the pandemic ([↑Khondoker, 2020](#)). This has been due to a combination of factors including inadequate educational facilities, poverty, inequality, and a lack of access to devices ([↑Chowdhury, 2020](#)). While there has been a shift towards relying on technology to deliver education around the world, it remains largely unknown how students living in Bangladesh's slum areas have adjusted to this shift.

1.2. Korail slum: the context of the study

This study focuses on the Korail slum, one of Dhaka's largest slums, which encompasses around 100 acres of land. Korail is located between the areas known as Gulshan and Banani. Most of Korail's residents come from impoverished regions in Bangladesh and have migrated to Korail after being evicted from Dhaka's other slums ([↑BRAC, no date](#)). The children of low-income families living in Korail face many difficulties on a daily basis due to the lack of resources to meet their basic needs. In 2020, the average monthly household income in Korail was around 5,000 to 10,000 BDT (around 59 to 118 USD) ([↑Bashar et al., 2020](#)).² This is well below the national average of 14,196 BDT (or 167.50 USD) ([↑Macrotrends, no date](#)). Residents of Korail and other slums in Bangladesh have been more vulnerable to the Covid-19 pandemic due to high population density, overcrowded family living conditions, inadequate hygiene maintenance, large numbers of people sharing kitchens and toilets, open drainage systems, socio-economic vulnerabilities, and psychological distress ([↑Mollah & Islam, 2020](#)). That said, however, Covid-19 infection rates were low in slum areas. Korail slum was described as a Covid 'paradox' partly explained by its system of governance and localised understanding and responses to the pandemic ([↑BIGD, 2021](#)).

Among the numerous problems plaguing the Korail slum, the residents have identified the lack of secondary schools as being particularly significant ([↑BIGD, 2021](#)). Although there are some schools inside the slum, many students attend schools located in the adjacent areas. The families living in Korail have been forced to contend with added financial strain during the Covid-19 pandemic, as many people have lost their jobs as a result of the pandemic. Experts fear that

² Exchange rate used in the study, 1 USD = 84.75 BDT

the worsening economic situation of Korail's residents, combined with the continued closure of schools, will accelerate secondary school level dropout rates, as students will be forced to acquire jobs to help generate income for their families rather than returning to school ([↑Mamun, 2020](#)).

Children living in Korail also faced barriers to accessing the Government of Bangladesh's televised education programmes, as many did not have access to a television ([↑Raha et al., 2021](#)). This is a significant issue, as technological devices can allow learning continuity through remote access ([↑Ozuorcun & Tabak, 2012](#)). However, the use of technology to access education in urban slums has not been significantly explored. This study aims to fill this gap in the literature by examining secondary level students living in Korail and assessing their access to technological devices for learning during the pandemic.

1.3. Purpose of this paper

The purpose of the study was to assess the resident children's access to technological devices and to identify the factors that influence their participation in tech-based remote learning. It specifically focuses on marginalised children living in the Korail slum during the Covid-19 pandemic. This study has three specific objectives:

- To understand how secondary school students (Years 6–10) living in the Korail slum have been using technological devices to participate in education during the pandemic.
- To examine the factors that facilitate and influence these students' access to the technological devices required for education.
- To recommend policies designed to improve these students' access to education via technological devices.

1.4. Research questions and research approach

Given the objectives of this research piece, the study seeks to answer two questions:

RQ1: What is the current state of children's educational technological devices in Korail slum to participate in education?

RQ2: What are some of the underlying factors influencing the access children have to these devices?

To answer these questions, we surveyed secondary school students (Years 6–10) living in Korail. Secondary school students at schools and madrasas were purposively selected for this study. The justification was that they were more

capable of comprehending and answering the survey questions compared to primary school students (Years 1–5), who were not. The data was collected from 476 households. Households were proportionally distributed among Korail's four clusters: Korail Beltola, Korail Bou Bazar, Korail Sonar Bangla, and Korail Jamai Bazar (BRAC's 'Urban Slum Map').

1.5. What this paper adds to the knowledge base

An extensive literature review found that few studies prior to the Covid-19 pandemic focused on the role of technology in aiding students' access to education among those living in slums. In addition, studies conducted during the Covid-19 period have made only modest contributions towards understanding how students living in urban slums have accessed technological devices for education. Most of these studies focus on the students' (both secondary and high school) experiences with e-learning and their ability to access the internet to participate; however, they do not provide a comprehensive understanding of marginalised children's access to tech-based education, nor do they enhance our understanding of the factors that influence these children's access to devices needed to access education. These gaps created an opportunity to examine access to tech-based education among children living in the Korail slum during the pandemic.

1.6. Implications for policy and practice

Bangladesh is a developing country that has been working diligently to ensure education for all, despite numerous obstacles such as lack of educational infrastructure, high dropout rates, poor access to technological devices for education, and economic challenges. The Covid-19 pandemic has significantly impacted the collective psyche, and it has radically changed the education system by connecting it with technological devices. The continuation of the pandemic and pandemic-driven changes in education will make the findings of this study highly relevant for many actors and stakeholders, including students, teachers, parents, educationalists, policymakers, and development workers.

The findings from this research can help decision-makers formulate policies appropriate for children living in urban slums. Although Bangladesh has enacted some reforms in the education sector, technological integration has not been significantly explored specific to children living in slums. Thus, this research could expedite an informed decision-making process. In addition, disseminating our research findings at academic and non-academic conferences could inspire researchers and practitioners to work jointly for the education of marginalised children living in urban slums.

1.7. Structure

This report consists of six sections. The introduction provides the background, context, and objectives of this study and explains its significance. [Section 2](#) reviews the existing literature and research in this area, and positions how this study can best contribute to the field of knowledge. [Section 3](#) provides a description of the research methodology, including the sampling procedure and sample size, data collection, and data analysis process. [Section 4](#) presents the main findings from the quantitative survey. Finally, [Section 5](#) discusses the policy implications of this study, and outlines a set of recommendations for integrating technology to provide education to children living in slums.

2. Literature review

In this section, we conduct a review of the relevant literature in order to gain a better understanding of the realities, complexities, and challenges that children — and especially those living in urban slums — face in accessing education. This section is divided into three sub-sections. [Section 2.1](#) briefly explains the methodological approach used to conduct the literature review. [Section 2.2](#) discusses the findings of the literature review. Section 2.2. consists of a further four subsections: [Section 2.2.1](#) examines issues related to education in slums around the world; [Section 2.2.2](#) explores education within the context of Bangladesh's slums in order to understand the factors that influence access to it; [Section 2.2.3](#) identifies the technological devices and platforms used to access education in urban slums, and [Section 2.2.4](#) discusses issues relating to the use of technological devices for education during the Covid-19 period. [Section 2.3](#) identifies the gaps in the literature and the way in which this study can contribute to the existing knowledge base.

2.1. Methodology of the literature review

The present literature review was conducted in three stages (see Table 1). The first stage aimed to identify very basic concepts that could be used to develop the research questions. To this end, we searched open-access sources for literature, which related to access to education for marginalised children, with a special focus on education in urban slums. Online blogs and Wikipedia references were removed before proceeding to Stage 2. This stage focused on literature related to the use of technology and digital platforms to access education around the world before and during the Covid-19 pandemic. The third and final stage examined literature that related to marginalised children's ability to access education through technological devices and digital platforms during the Covid-19 pandemic. The use of this three-stage approach helped to conduct the literature review in a more organised manner.³

³ Any literature published prior to 11 March 2020, was considered a pre-Covid-19 resource, while literature published after 11 March 2020, was considered a during-Covid-19 resource.

Table 1. *Three stages of the literature review process.*

Stage	Concepts	Search terms
Stage 1 (Primary Concepts) [Preliminary review of the basic concepts]	Education; access to education for marginalised children; access to education in urban slums.	Education; access to education for marginalised children; urban slums; education for children living in urban slums globally / in Bangladesh.
Stage 2 (New Concepts) [Developed after reviewing the literature found in Stage 1]	Access to education using any technological devices and / or digital platforms globally (before and during the Covid-19 pandemic).	Mobile devices; education through mobile / technological devices; distance learning; technology use in education; technology usage in slums for education; technology usage for students in Bangladesh; technology for remote learning.
Stage 3 (Application of Concepts) [Concepts developed through Stages 1 and 2]	The application of technology in education for marginalised children during the Covid-19 pandemic in urban slums.	Access to education using technology in Bangladesh during the pandemic; technology used to provide education in urban slums in Bangladesh during the pandemic.

Google Search and Google Scholar served as the principal search engines for the literature review, along with the Social Science Research Network, Educational Resources Information Centre (ERIC) and Semantic Scholar, which were employed as secondary search engines. During the searches in the three stages, a total of 65 documents were retrieved. However, only 33 of these sources were included, as they most closely aligned with the study's main concepts.

The literature review was an ongoing process. If new relevant literature was discovered while the study was being undertaken, it was reviewed to determine whether or not it met the inclusion criteria.

2.2. Findings from the review

This literature review provides an overview of the state of education in slums, and the use of technological devices to improve access to education for children living in these areas. Although this study focuses specifically on Bangladesh, for the literature review we also reviewed literature relevant to other country and regional contexts. The following subsections present the key findings of the literature review.

2.2.1. Accessing education in slum areas

Even prior to the pandemic, children living in urban slums faced a relatively complex set of challenges with respect to accessing education. This was true for children living in slums across the world, including India ([↑Siddiqui, 2017](#); [↑Tripathi, 2019](#)), Kenya ([↑Njeru, 2010](#)), Pakistan ([↑Sattar & Zhang, 2017](#)), Indonesia ([↑Cho, 2020](#)), and Brazil ([↑Schmidt, 2014](#)). Challenges included financial challenges experienced by caregivers due to the lack of work opportunities available. This forced many children to find work ([↑Cho, 2020](#); [↑Njeru, 2010](#); [↑Siddiqui, 2017](#); [↑Tripathi, 2019](#)). Inadequate remote learning opportunities were identified as another key barrier impacting the ability of children to access and continue their schooling in the slums of Kenya, Pakistan, and India. Besides these factors, a lack of institutional support, inadequate learning and instructional materials ([↑Njeru, 2010](#)), lack of schools in slum areas ([↑Sattar & Zhang, 2017](#)), and distance from home to upper primary schools ([↑Siddiqui, 2017](#)) were also identified as barriers to children's access to education in the literature reviewed. A survey within the slums of Islamabad in Pakistan found that a one-kilometre increase in distance from the nearest school negatively affected a child's school enrolment by 46% ([↑Sattar & Zhang, 2017](#)).

Various issues influence dropout rates among slum students. A survey conducted in Indian slums showed that more than 40% of students left school to care for siblings or engage in domestic work, or due to economic problems, distance from upper primary school, illness, or a lack of scholarships ([↑Siddiqui, 2017](#)). In complex contexts like the Cité Soleil (Haiti), young people frequently left school before completing their secondary studies and joined gangs at an early age due to a lack of social mobility ([↑Robillard, 2015](#)).

Parental communication skills and emotional challenges were also identified as barriers to accessing education for children in slum contexts. In Kenya ([↑Njeru, 2010](#)) and Indonesia ([↑Cho, 2020](#)), weak parent–child relationships negatively affected marginalised children's access to education. In addition, weak communication between parents and teachers also reduced the likelihood of parents sending their children to schools ([↑Njeru, 2010](#)). [↑Cho \(2020\)](#) identified that broken family structures, abusive parenting, bullying, and

stigmatisation in schools socially and emotionally demotivated children in Indonesia from attending formal schooling systems. Furthermore, inadequate nutrition, poverty, and improper health conditions — including poor sanitary systems — negatively influenced children's access to education in slum contexts in India, Kenya, and Indonesia ([↑Cho, 2020](#); [↑Njeru, 2010](#); [↑Siddiqui, 2017](#); [↑Tripathi, 2019](#)). According to [↑Mberu et al. \(2016\)](#), health concerns also hindered the establishment of schools and other educational institutions in slum areas. Ultimately, such inadequacies undermined slum students' ability to access formal education ([↑Mberu et al., 2016](#)).

Some studies have explored practical initiatives undertaken in different parts of the world to mitigate problems limiting children's access to education in slum contexts. In India, NGOs have tried to expand access to education by providing facilities like ballades,⁴ offering non-formal education, and helping enrol students in schools ([↑Sonawat & Sikh, 2007](#)). Elsewhere in Kenya, community leaders are influential members of their community, and NGOs used their influence to encourage parents to take a more active interest in their children's education ([↑Abuya et al., 2018](#)).

2.2.2. Educational landscape in the urban slums: the Bangladesh context

According to [↑Habib \(2009\)](#), there are three types of educational institutions in Bangladesh, which are differentiated based on their source of funding and operational mandates. The first type of school is government schools, which receive funding from the government, with either the government or private entities operating these schools. The second type of school is those operated by NGOs. The third type of institution is those which are privately operated and funded. Madrasahs (Alia) are generally funded by the government, although there is another type of Madrasah, called a Qawmi, that is operated through public charity ([↑Abdalla et al., 2004](#)). Education in the urban slums of Bangladesh consists of a mixture of government and NGO-run educational facilities. Opportunities for slum children to attend educational institutions may vary considerably for several reasons ([↑Cameron, 2010](#)). For instance, marginalised children living in slums are heavily dependent on non-governmental initiatives. Despite having government-run schools in and around the slums, children living in slums are often unable or unwilling to attend these schools due to the associated costs or their parents' lack of will to send them there ([↑Habib, 2009](#)). Slum students also avoid enrolling in private schools due to the social stigmatisation they often face due to them coming from the slums ([↑Habib, 2009](#)).

⁴ Ballades are where delivery of lessons are delivered in the form of poetic or musical form.
Integration of Technology in Education for Marginalised Children in an Urban Slum of Dhaka

Among the NGO run schools, BRAC operates around 35,957 schools and community learning centres all over Bangladesh, including in the urban slums. The number of educational initiatives operated by BRAC in urban slum settings is not publicly disclosed ([↑BRAC, 2019](#)). For many children living in urban slums, NGO-run schools are the most viable sources of education, especially at the primary level ([↑BRAC, 2019](#)). Nonetheless, heavy reliance on NGOs has some problems. For example, NGOs explicitly target the poorest children, which can create a sense of 'social stratification' among the slum dwellers ([↑Ahmmed et al., 2012](#)).

Apart from limited enrolment, children living in urban slums who do enrol in educational institutions tend to have a high dropout rate (65%) ([↑Zaman, 2014](#)). [↑Smita et al. \(2020\)](#) examined the various reasons for inadequate enrolment and the high dropout rate among marginalised children. Among male children, they found that boys were forced to find employment to help alleviate their family's poverty, while others simply lacked any interest in school. In contrast, female children often did not enrol or dropped out to stay home and assist with household work, or due to early marriage ([↑Smita et al., 2020](#)). [↑Quattri & Watkins \(2016\)](#) found that financial problems, poor quality of education, and lack of attention to their needs were the main reasons for the high dropout rate among marginalised students.

A [↑World Bank \(2007\)](#) report focused on the environmental aspects of access to education, arguing that environmental and health issues were challenges that education providers had to overcome in order to expand access to education in slums and to operate educational institutions. As slums in Bangladesh are mostly located in low-lying areas, they often lack appropriate drainage systems and are prone to waterlogging and flooding in the rainy season. As such, teachers and children must often overcome geographic difficulties in attending educational institutions. Other environmental factors like cramped slum conditions and narrow muddy roads also limit children and teachers' access to educational institutions ([World Bank, 2007](#)).

2.2.3. Use of technological devices and digital platforms for accessing education in urban slums

Despite their limitations in delivering education to children in slums, technology-based educational initiatives have gained currency in some areas. In Nigeria, a social development organisation named 'Slum2School' built a virtual learning classroom in mid-2020, which has served 948 children living in the slum and remote communities ([↑Campos, 2020](#)). They also provided internet connectivity and headphones to the children, ensuring that they were able to participate in classes ([↑Salaudeen & Patrick, 2020](#)). An NGO in India harnessed computer-based learning to design a Bridge Course programme

that allowed children to enter or be readmitted to the formal school system ([↑Sonawat & Sikh, 2007](#)). This NGO's (known as 'P') mission has been to universalise primary education in India, and to date, it has served 0.2 million children through direct programmes. P creates a low-cost replicable model that can be used to provide basic mathematics education through computer-based learning ([↑Sonawat & Sikh, 2007](#)).

In Bangladesh, some international NGOs, in partnership with local NGOs, have been trying to provide education to children living in slum areas. For instance, 'Children on the Edge', partnering with 'Mukti' is delivering quality education for children in Cox's Bazar who cannot access education ([↑Children on the Edge, no date](#)). 'Moja Kids' is another online platform for children that records newsletters and shares them with the Rohingya children residing in Kutupalong camp in Cox's Bazar. In learning to use technology to express their thoughts, the children become empowered to showcase their talents and share their experiences ([↑Children on the Edge, no date](#)).

Unfortunately, the above studies do not clearly articulate how exactly children living in urban slums are able to access tech-based online education to overcome the persistent 'digital divide'. Financial disparities among different socio-economic classes have been identified as the most challenging factor in using technological devices to access education ([↑Ahmed et al., 2020](#); [↑Emon et al., 2020](#); [↑Raha et al., 2021](#)). Other factors undermining the implementation of tech-based online education include inadequate facilities, adverse home conditions, communication and information gaps, and lack of experienced teaching staff ([↑Ferri et al., 2020](#)). The transition from face-to-face classes to online classes has not been satisfactory for many due to a lack of interaction with teachers ([↑Rahman et al., 2021](#)). Nevertheless, technological devices and digital media have been considered useful in providing education for those who have access to such tools.

2.2.4. Access to education using technology during the Covid-19 pandemic

Due to the lack of access to technological devices experienced by many learners, many countries rolled out distance learning programmes using television and radio-based programming during the Covid-19 pandemic ([↑UNESCO, 2020](#)). The Government of Bangladesh's initiative of using the national television channel to broadcast educational lessons was a quick alternative to fill the educational gap following the closure of all educational institutions. However, students did not widely utilise this resource due to the technical and structural problems associated with it. These included no direct

student–teacher interaction, poor video and audio quality, etc. (†[Raha et al., 2021](#)).

The sudden closure of NGO programmes at the start of the pandemic made it more difficult for marginalised children to attend schools supported by these organisations (†[Anwar et al., 2020](#)). Some students (from governmental, NGO, and private schools) attempted to attend classes using their existing technological devices and / or social media platforms. A recent study by †[Raha et al. \(2021\)](#), which focuses on two peri-urban slums and one low-income settlement area in Dhaka, found that all of the adolescent children surveyed had used one or two social media networks as online learning platforms. These platforms included Facebook Live, WhatsApp, Messenger, Zoom, YouTube channels like 10 Minutes School, Konnect, Kishor Batayan, or else, IMO — a video, calls and chat application — for tech-based distance learning. Most of these children used their parents' mobile phones to attend these classes (†[Raha et al., 2021](#)). Various other contextual and proximate factors undermined children's access to classes. These included those relating to lack of resources such as not having enough mobile devices in the household or inadequate and costly internet connection, to conflicts in scheduling between educational content and other programmes watched by family members on television (†[Raha et al., 2021](#)).

To attend online classes, students need access to cellular data. There are disparities in access to internet connections, which are connected to family socio-economic status. Families with higher levels of education and higher incomes who live in megacities like Dhaka and Chattogram tend to have greater access to the internet. In addition, males have greater access to the internet compared to their female counterparts (†[Siddiquee & Islam, 2020](#)). Digital divides create digital inequality, and, in educational institutions, such inequality stems from a lack of knowledge and skill relating to the use of technological devices and ICT, lack of affordability due to low family income, and cost of internet bandwidth (†[Islam & Inan, 2021](#)). However, in a recent survey of university students in Bangladesh, around 74% of respondents said that learning through mobile devices and social media was an excellent approach to minimising the study gap during the pandemic (†[Biswas et al., 2020](#)). Unfortunately, none of the above studies has illustrated the impact on learning using technological devices to deliver online education.

2.3. Perceived gaps in the existing literature and concluding remarks

The literature review in this section found a paucity of research focusing on the use of technological devices to enable access to education among

marginalised children living in urban slums. The most recent survey conducted in the Bangladesh slums during the Covid-19 pandemic (March 2021; [Raha et al., 2021](#)) sought to capture the educational experiences of slum children. However, the approach it utilised was a qualitative one and therefore only looked at a limited number of participants (30 children). Other literature reviewed for this section did not highlight the issues slum children may face when using technological devices to access education. Additionally, the majority of the literature on education using technological devices focuses on university students, private schools, and colleges, or consists of comparative analyses of urban and rural students. Few studies have examined this in the context of marginalised children living in urban slums.

These gaps in the literature have created an opportunity specifically focusing on the role of technology in the context of urban slums. This research aims to assess the use of technological devices to provide students in slum contexts with access to education. Furthermore, we seek to understand the factors and proximate issues that slum children must contend with while using technology to access education.

3. Methodology

This section details the methodological approach used in this study, namely, a quantitative survey focusing on capturing information on technology to access education by secondary school students living in the Korail slum. We begin by outlining the research questions that guided this work, followed by a discussion of the rationale for conducting quantitative research in the Korail slum. Next, the research design, sample size, data collection instrument, data collection and analysis process, research participants, and ethical issues and challenges of this study are detailed.

3.1. Research questions

Two research questions guided this study's objective. These were:

RQ1: What is the current state of children's educational technological devices in Korail slum to participate in education?

RQ2: What are some of the underlying factors influencing the access children have to these devices?

3.2. Research framework and design

This research utilises a quantitative research method to collect and analyse data. Specifically, data collection entailed the administration of a questionnaire survey to secondary school level students living in Dhaka's Korail slum. The main reason for selecting a quantitative survey was its effectiveness in producing results that can aid in understanding a given phenomenon — in this case, students' access to education through technological devices during the Covid-19 pandemic. Furthermore, this method also helps to avoid guesswork, as it is predicated on clearly stated objectives, guided research design, and the development of precise questions for data collection. Moreover, the selected approach allows the research team to remain objective while analysing and presenting the research findings.

This study uses a statistical formula to set the sample size, as data relating to school-going children living in the Korail slum was unavailable due to school closures and other restrictions related to the ongoing pandemic. The selected statistical formula considered the total number of households in the four clusters of the Korail slum (15,921; Table 2), with the desired sample size calculated with the following equation:

$$n = \frac{Z^2 P(1-P)}{e^2} * D \dots\dots\dots (I)$$

In this formula, n = size of the sample, Z = the value of the standard normal variable (equal to 1.96 at 5% level of significance), p = the proportion of people who are dropouts (assumed to be 0.50, which provides the maximum sample size, as there have been no previous studies examining this figure), e = the level of precision or maximum error acceptable (assumed to be 0.05), and D = design effects (assumed to be 1.25). This yielded a sample size of 476, which was then distributed proportionately across the four clusters of the Korail slum: Korail Beltola, Korail Bou Bazar, Korail Sonar Bangla, and Korail Jamai Bazar (as indicated on BRAC's 'Urban Slum Map'). These clusters are defined by natural boundaries, such as bodies of water and naturally created streets. This cluster sampling method helped to ensure a representative sample (based on systematic random sampling) because it encompassed residents from all four of Korail's clusters (Table 2).

Table 2. *Sampled household per cluster.*

Four Clusters of Korail Slum	Number of Households	Number of Inhabitants	Sample Households
Korail Beltola	2274	6360	68
Korail Bou Bazar	5059	13126	152
Korail Jamai Bazar	5370	18860	160
Korail Sonar Bangla	3218	9725	96
Total Sample Household	15921	48071	476

3.3. Research instruments / tools

We developed a quantitative survey questionnaire to gain a deeper understanding of how accessible technological devices were for children living in the slum (RQ1) and the extent to which broader socio-economic factors influenced access to these devices (RQ2).

The survey questionnaire was developed in an online workshop conducted with members of this project, including experts, research associates, supervisors, and the team leader. During the workshop, attendees discussed various concepts and aspects to identify variables for this survey and to elicit responses from respondents that would optimally meet the research objectives. However, before developing the survey questionnaire, we conducted an initial literature review to understand the inclusion of various technological devices in education, focusing on the slum context. In addition, a

four-member team travelled to the Korail slum for a short field visit to understand the survey area and examine the feasibility of conducting a survey during a pandemic.

Before conducting the final survey, we piloted the survey tool. This approach helped us test the initial survey instrument and identify what aspects needed to be changed before beginning data collection. Despite the conditions created by the Covid-19 pandemic (e.g., continuous lockdown), the pilot team was able to survey a total of eight participants from Korail's four clusters. After analysing the pilot results, we made changes to clarify some of the questions related to demographic information, and we also modified some of the questions focusing on the frequency of the students' device usage for educational purposes.

Most of the questions in the final survey questionnaire were closed-ended, but there were also a few open-ended questions in the final section (see [Annex 1](#)). The final survey questionnaire consisted of six sections (Table 3).

Table 3. *Survey questionnaire by key sections.*

Section no.	Section Title	Section Details	Relevance to the Research Questions and Data Analysis
I	Household roster	This section is for the parents / guardian of the student respondent. It consists of questions relating to their demographic information, economic condition, and assets to measure their primary wealth. This section helps to list the household members and identify and select the child respondent from each household.	The questions in this section help to understand the respondents' socio-economic conditions. In addition, family income, parents' education, and other relevant information help to establish the students' background. These factors are related to RQ2.
II	Basic information about the student respondent	This section is designed to collect basic information about the participating students, for example, level of study, name of educational institution, and involvement in jobs.	This section helps to analyse the backgrounds of the students, which is related to RQ2.
III	Access to mobile devices and internet	The section consists of questions related to the students' access to technological devices, the internet, and other facilities required for online education, as well as factors	This section helps to understand the students' broader access to technology, which is related to RQ1.

		that influence their participation in tech-supported education.	
IV	Pre-pandemic state of accessing education	This section contains questions about the students' pre-pandemic access to education and identifies the extent to which they used digital devices to do so.	The questions in this section seek to understand students' access to and knowledge of how to use technological devices before the pandemic. These factors are critical, as they enable a comparison of the students' use of technological devices before and during the pandemic period. The questions in this section are related to RQ1 and RQ2.
V	Accessing education during the pandemic	This section comprises questions related to the students' access to tech-device-supported education during the pandemic and identifies the factors influencing their participation in the education process.	This section helps to analyse students' access to tech-based education during the pandemic, which is related to RQ1.
VI	Opinion and recommendation	This final section consists of three open-ended questions, which allow the respondents to make any additional comments and provide ideas on how to overcome challenges associated with accessing education and the use of online platforms to access education in the future.	This section provides an understanding of the students' perceptions about how to overcome challenges related to tech-based education, and how to continue education in the future if the pandemic continues. These questions are linked to RQ1 and RQ2.

3.4. Data collection and analysis

The research design, including the data collection and analysis process, was guided by the above-noted research objectives and questions. The survey focused on students enrolled in educational institutions (e.g., school and madrasah) that followed the Bangladeshi National Curriculum and contained secondary school level students (i.e., Years 6–10).

Before administering the survey questionnaire in Korail, the research team arranged a training workshop for the 10 data collectors (four males and six females). The workshop was designed to provide the data collectors with a better understanding of the research objectives and to train them on how to do the following.

- Describe the research ethics clearly and accurately.
- Obtain informed consent from the respondents (both from the parent(s) / guardian and the respondent in each household) and impart that their participation is voluntary.
- Ask children under 18 questions for the purpose of data collection.

Since a complete list of the households in the Korail slum was not available, we selected a common starting point in each cluster and applied a ‘pen throw’ method to select survey respondents. This method involved throwing down a pen and once the direction of the pen had been established, the data collectors went door to door, surveying every fourth household. This process continued until the desired number of respondents had been obtained in each cluster. The marked boundaries of Korail slum made it easy for data collectors and field supervisors to identify which of the four designated clusters they were working in. Finally, when more than one student was present in a household, the data collector chose the eldest student to participate in the survey.

Once data collection had been completed, a codebook was prepared to include all of the variables that were to be inserted into STATA for statistical analysis. The codebook then analysed the dataset according to relevant variables, such as demographic background (e.g., age, gender, grades, etc.), socio-economic background, educational status before and after the onset of the pandemic, access to technological devices, and level of education (e.g., Years 6–10). Some of the key areas of analysis included tech device ownership, access to technological devices for educational purposes during the pandemic, challenges associated with accessing technological devices for education, and suggestions for continuing studies if the pandemic continues.

3.5. Stakeholders

This research team consulted with two groups of stakeholders and respondents who participated in the household survey. Different parts of the survey questionnaire were directed to two categories of participants. The household roster in the first part of the survey was completed by an adult (i.e., mother, father, elder brother, or any legal guardian). This roster helped us identify the family members in each household according to their age, job, and educational attainment. Based on the household roster information, a student enrolled in Years 6–10 at a recognised educational institution was selected to take part in the data collection. Interviews were conducted face-to-face in the home by a field data collector.

3.6. Ethical considerations

Since this research focused on students who were under the age of 18, we took a number of measures to preclude any unintentional adverse effects on the participants and to ensure their participation was truly voluntary. For instance, we used a two-stage consent process. First, we obtained permission from a parent or legal guardian in the household. This was followed by a discussion with the student to obtain their consent to participate. The details of the project, its aim and objectives, potential outcomes, the participant's right to withdraw from the survey process at any time, and the scope of their participation were made clear before the respondent was allowed to participate. The participants were also ensured that no identifiable personal data would be shared with any other party and that their responses would not be used for any other purpose than the aims and objectives of this research. This guarantee of anonymity and the confidentiality of the respondents' data was provided and respected.

3.7. Challenges and limitations

Conducting research during the Covid-19 pandemic was a daunting task. The main challenges that the research team faced were the continued Covid-19 related restrictions and increased rates of infection and death in Bangladesh. Due to Covid-19 restrictions, we had to reschedule some of our planned activities in this research process. For example, the field visits, which were necessary in order to administer the surveys, became challenging for the team due to the ongoing lockdowns. Thus, we were only able to conduct the survey during the small windows when the lockdown was lifted, which limited our ability to travel inside the Korail slum. We focused on how to collect data quickly using only 10 data collectors. We provided all data collectors and field supervisors with the necessary personal protective equipment to ensure personal safety. Another limitation of this study is that it was conducted in just one urban slum in Dhaka. The findings would have been more robust and generalisable if data had been collected from more than one slum.

4. Findings

This section presents and analyses the survey data in order to determine the state of access to technological devices for educational purposes among secondary students living in the Korail slum and to examine the factors that influence access to these devices. Throughout this section, when anything is referred to as ‘online’ education this refers to where students accessed education through technological devices which required the internet. ‘Tech-based’ education, on the other hand, refers to accessing educational content through devices that may or may not require the internet.⁵ This section is divided into six main parts. [Section 4.1](#) details the background of the survey respondents. [Section 4.2](#) discusses technological device ownership in Korail households. [Section 4.3](#) examines the use of technological devices to access education during the pandemic period, particularly the frequency with which students used these devices for tech-based classes and physical in-person classes. In addition, Section 4.3 also explores the media and platforms that students use to access tech-based education. [Section 4.4](#) presents our results based on the regression that we ran to identify the factors that influence technological device ownership and access to tech-based education. [Section 4.5](#) examines how students wish to continue their studies if the pandemic continues. Finally, [Section 4.6](#) consists of critical discussions inferred from the findings and explores their convergence and divergence with the existing literature.

4.1 Background of the survey respondents

The subsamples were proportional to the population of the four clusters this study focused on; therefore out of the 476 respondents, 33.47% were from the Jamai Bazar cluster, 31.79% were from the Bou Bazar cluster, 20.42% were from Sonar Bangla, and 14.32% were from Beltola.

Two-thirds of the respondents were female (66.95%) ([Table 4](#)), as more female students were available in the households during the interview phase. The mean age of the respondents was 14.27 years, with a standard deviation of 1.84. The respondents included students from Years 6–10, with 25% being in Year 10, 24% in Year 6, 18% in Year 8, 17% in Year 9, and 16% in Year 7. Respondents were surveyed based on their availability and their seniority if there were multiple potential respondents in a household.

The majority of surveyed students (95%) were not currently employed in any job other than study. Those who were employed were mostly assisting others

⁵ In the context of this report this would include educational content students access on the television.

in business activities. A higher proportion of male students (10%) surveyed were in employment compared to female students (2%). The difference between these groups was statistically significant ($p\text{-value} < 0.01$).

Table 4. Descriptive statistics of the respondents: Cluster, class, and gender distribution.

	Class / Grade					
	Six	Seven	Eight	Nine	Ten	Total
Beltola (%)	16.81	15.38	10.47	12.82	15	14.32
Bou Bazar (%)	32.74	28.21	37.21	24.36	34.17	31.79
Jamai Bazar (%)	32.74	41.03	29.07	38.46	29.17	33.47
Sonar Bangla (%)	17.7	15.38	23.26	24.36	21.67	20.42
Total (%)	100	100	100	100	100	100

	Class / Grade					
	Six	Seven	Eight	Nine	Ten	Total
Male (%)	23.89	29.49	32.56	42.31	38.33	33.05
Female (%)	76.11	70.51	67.44	57.69	61.67	66.95
Total (%)	100	100	100	100	100	100

4.2 Technological device ownership and access to the internet

Tech device ownership is a critical element of this study. Out of the 476 surveyed households,⁶ 85.16% owned a television, 77.85% had smartphones, and 41.78% had Wi-Fi (Table 5). Thus, the surveyed students tended to have high levels of ownership of devices that allowed them to access government-supported educational activities during the pandemic — most of which were administered via television.

Ownership of high-technological devices such as computers, laptops, desktops, and tablets was very low among the surveyed households, as was ownership of other low-technological devices, such as radios.

Table 5. Technological devices / services owned by households.

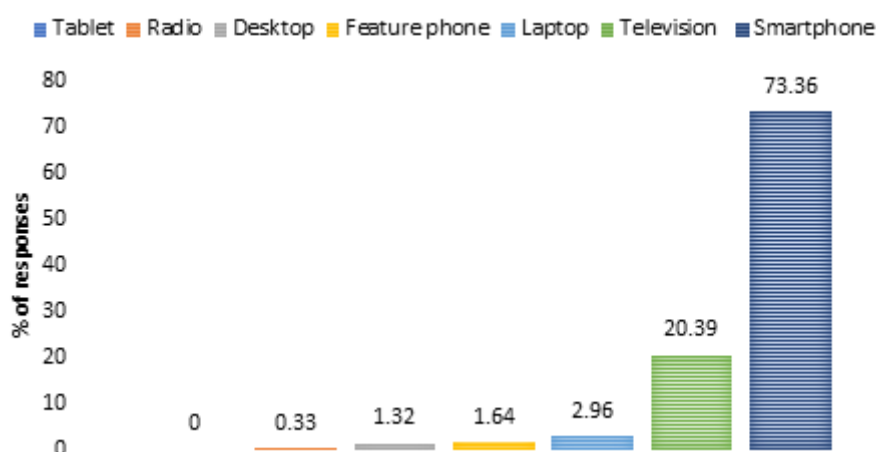
Type of technological devices / services	Frequency	Percentage of cases (%)
Television	373	85.16
Radio	4	0.91
Smartphone	341	77.85
Tablet	5	1.14
Desktop	10	2.28
Laptop	13	2.97
Wi-Fi	183	41.78

⁶ Multiple response selection was possible; hence, the sum is greater than 100.

It appears that tech-device ownership — at least with respect to certain devices — may not be as significant a problem for this segment of the population as is popularly thought. Although all households owned technological devices, some heterogeneity was observed among the incomes⁷ of households for certain devices. For instance, the richest households were significantly more likely to own laptops (9% *vs* 1%; $\chi^2 = 10.73$, $p < 0.013$), smartphones (87% *vs* 52%; $\chi^2 = 39.62$, $p < 0.001$), and desktops (6.41% *vs* 0%; $\chi^2 = 10.67$, $p < 0.014$) compared to the poorest households; however, the results were not statistically significant for other devices (see [Annex 2, Table A1.1](#)).

With regard to the types of technological devices used by students for e-learning, smartphones were by far the most common at 73% (adjusted for multiple responses), followed by television (20%) (Figure 1, below). About 3% of respondents indicated that they used a laptop in their education, which is well below the national average (14%) ([Alliance for Affordable Internet & A2I Programme, no date](#)).

Figure 1. *Types of devices used for education.*



While having access to devices is necessary to participate in tech-based education, it is equally important to have access to a reliable internet

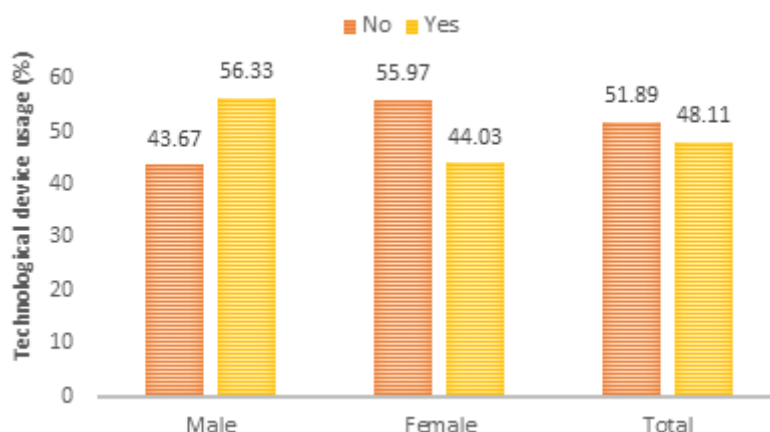
⁷ Continuous income measures were not included in the survey, rather the survey had an estimate of income range (category or ladder) for each individual of the household. Since categories were organised in ascending order, we were able to get an estimate of income for each individual in the households. Adding income earners monthly income (i.e., category), household income was estimated, then these household incomes were divided into four groups: these were the 'poorest' (up to the 25th percentile), 'poor' (between the 25th and 50th percentile), 'rich' (between the 50th and 75th percentile) and the 'richest' (75th percentile or above). Traditionally income distribution is done according to quintiles where there is a significant variation among the population income. However, for this study, there was only one slum with no significant income variation.

connection, as much e-learning is conducted via online platforms such as Zoom or Google Meet, YouTube, and Facebook. The survey findings showed that 65.34% of students had access to the internet (See [Annex 2, Figure A1](#)). Of those with internet access, approximately 85% used Wi-Fi, with 56% of these students sharing a Wi-Fi connection with other families and neighbours. Additionally, 18% of respondents said that they accessed the internet via mobile data. The relatively low number of people who access the internet in this manner is likely due to the high costs of mobile data in Bangladesh. Even though overall internet access for the respondents was 65.34%, there was a stark gender disparity: 77% of male respondents had internet access compared to only 59% of female respondents, with this difference being statistically significant ($\chi^2 = 16.35, p < 0.01$) (See [Annex 2, Figure A2](#)). Interestingly, almost all respondents said that their homes were equipped with electricity, and that power outages were minimal (lasting less than two hours in 90% of cases). Even though power outages were not a major issue, the timing of an outage could pose a significant problem; indeed, 35% of respondents said that their education had been hampered by a power outage in the past. However, no significant differences were observed across income and gender with respect to power outages.

4.3 Access to technological devices for education during the Covid-19 pandemic

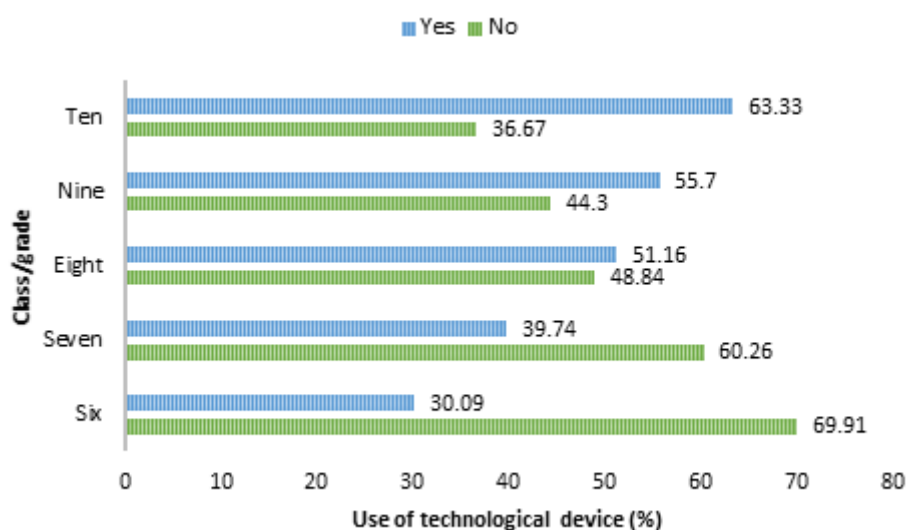
Before the Covid-19 pandemic, students had little experience using technological devices for education. Other than in-class device usage (e.g., classroom devices such as multimedia projectors), the surveyed students had little to no experience using modalities such as social media, TV channels, and online platforms for educational purposes (see [Annex 2, Table A28](#)). During the pandemic, however, nearly half (48.11%) of the respondents surveyed indicated that they began to use digital platforms or technological devices for educational purposes (Figure 2, below). Of the respondents surveyed, 84% indicated that their teachers had contacted them via telephone to discuss their education. Since there was no question to capture whether the phone call had been placed for teaching or other purposes (i.e., administrative issues related to education), the nature of these calls remains unclear. Nonetheless, the major type of phone-based communication was voice calls (85%).

Figure 2. Proportion of students (by gender) using technological devices for education.



Gender differences also appear to exist in tech device usage for education. While 56% of male respondents said that they had access to technological devices for education, this was only the case for approximately 44% of female respondents. Although this difference is statistically significant ($\chi^2 = 6.04, p < 0.01$) no statistically significant difference was observed between income levels and clusters (see [Annex 2, Table A1.1](#) and [Table A1.2](#)). Students in the higher years (Years 8, 9, and 10) were found to have greater access to technological devices compared to those in the lower years (Years 6 and 7) (Figure 3); once again, this difference was statistically significant ($\chi^2 = 30.17, p < 0.001$). Thus, a positive correlation between class / age and technological devices is evident.

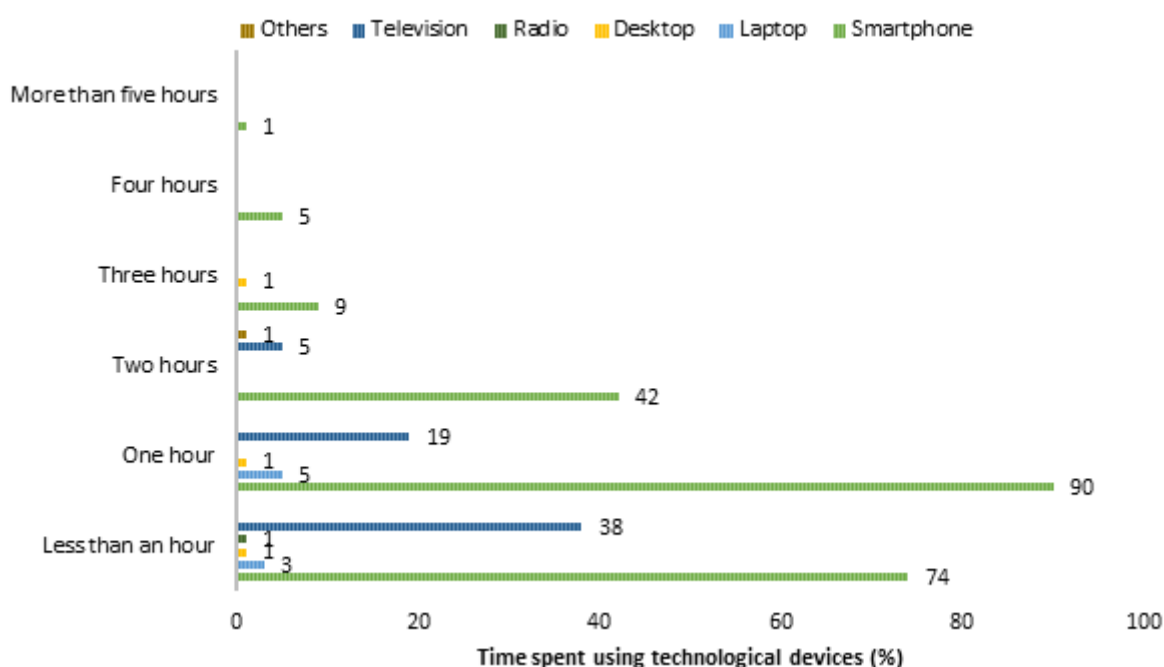
Figure 3. Technological device used for education by class / grade.



4.3.1. Frequency of tech-device use by students for education

As shown above, smartphones and television are the devices most commonly used for education. In addition to determining whether students have access to technological devices, it is also important to examine whether they are receiving enough time to use them for educational purposes. Daily device-usage time was not very high, as more than 90 respondents reported using their device (mostly smartphones) for two or fewer hours per day, with 74 respondents reporting that they used their device for one hour or less (See [Annex 2, Table A1](#)). However, since most online or tech-based classes were less than two hours, these usage times could be reasonable.

Figure 4. *Time spent using technological devices per day.*



Overall, 40% of respondents reported using their technological device for less than one hour per day. This is a concerning finding, as one hour or less of ‘class time’ may not be sufficient for continuous education. However, no income, cluster, and gender differences were observed (See [Annex 2, Table A1.3](#)).

4.3.2. Reasons for not using technological devices for education

Of the respondents who did not use technological devices, 55% lacked access to a device, and 39% cited financial barriers (Table 6, below). Other reasons given by the participants included their parents’ lack of trust about their use of a digital device; lack of knowledge about how to use the device; lack of parental

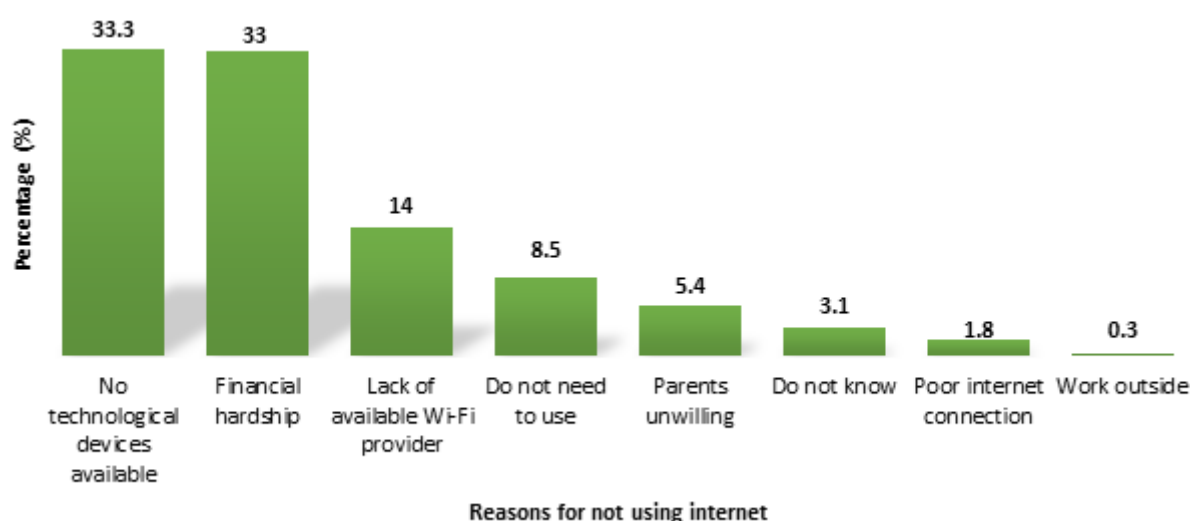
permission; and lack of interest. However, there were no gender differences in relation to the above reasons.

Table 6. *Reasons for not using any technological devices for education.*

Reasons	Frequency	%
Lack of adequate number of technological devices to share	132	55.00
Lack of trust of parents for using devices	23	9.58
Lack of knowledge about how to use the device	20	8.33
Lack of permission from parents	26	10.83
Lack of interest of the respondent	33	13.75
Financial hardship	94	39.17

Those who did not have internet access could also not attend online classes. Lack of internet access was mostly connected with financial hardship and not having any technological devices (Figure 5). Two additional reasons for the lack of internet access included simple unwillingness on the part of the respondent's parents and their parents' inability to recognise its utility value.

Figure 5. *Reasons for not using the internet.*



Notably, household income appeared to be related to internet access, with the richest households having significantly higher rates of internet access. Whereas more than 70% of homes in the richest households had internet

access, this was only the case for 53% of households in the poorest households. This difference was statistically significant ($\chi^2 = 13.40$, $p < 0.004$). Some cluster-level effects were also observed, with the Beltola and Sonar Bangla clusters having higher internet access than the Bou Bazar and Jamai Bazar clusters. Once again, this difference was statistically significant ($\chi^2 = 8.63$, $p < 0.035$). One potential reason for the higher rates of internet connectivity in the Beltola and Sonar Bangla clusters may be that they have more people who fall within the richest households.

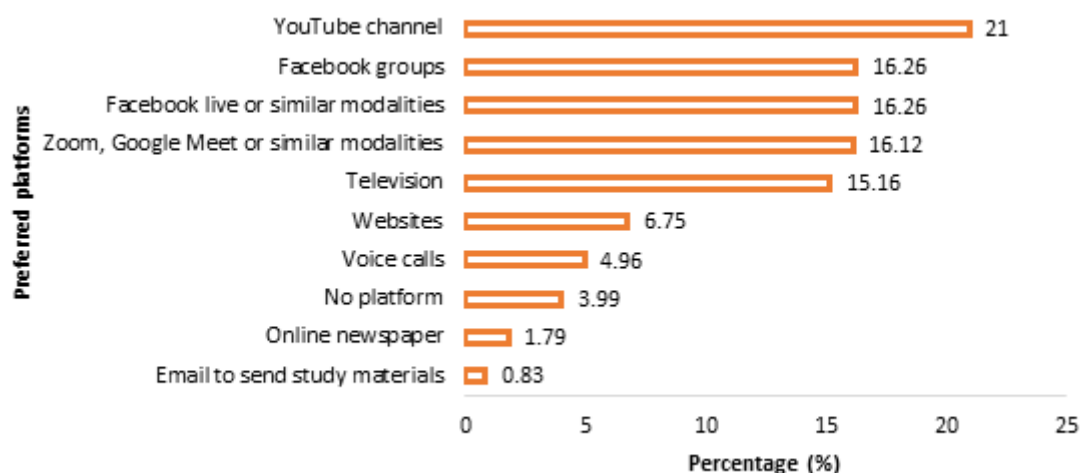
4.3.3 Modalities used to access tech-based education during the pandemic

The most common modalities used to access tech-based learning were YouTube (38.10%) and Facebook (25.21%). Despite the government's attempts to promote the delivery of educational programming via television, only 22.01% of respondents reported utilising this modality, less than either YouTube or Facebook (Table 7, below).

Table 7. *Modalities used for tech-based education.*

	Responses %
Educational programme on TV	22.01
YouTube channels	38.10
Facebook channels	25.21
Educational websites	12.78
Online newspapers	1.77

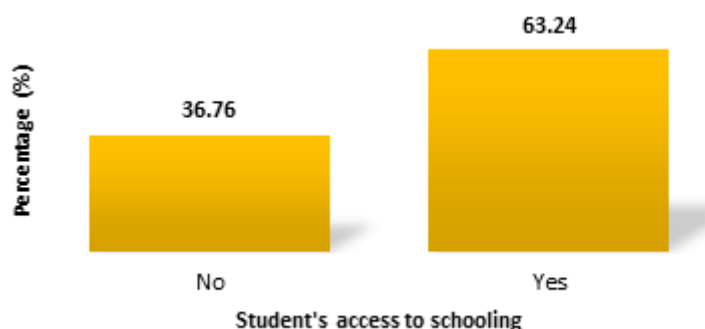
As illustrated in Figure 6, below, YouTube (21%), Facebook groups (16.26%), Facebook live or similar modalities (16.26%), and Zoom / Google meet (16.12%) were the most preferred platforms for tech-based education. Furthermore, the students identified teachers, schools, and friends as their main sources of information about tech-based online platforms. Although there were no evident differences between households from different income levels, residents of Bou Bazar and Jamai Bazar tended to use television over other platforms more often than the residents of Beltola and Sonar Bangla ($\chi^2 = 8.28$, $p < 0.041$). This finding is consistent with our prior finding that households in the latter areas have lower levels of internet access. Thus, residents in these areas were forced to rely more on television as a medium of accessing education.

Figure 6. Preferred platforms for tech-based modalities among students.

Regarding online platforms, Facebook live and Google classroom were the most used. Of the 42% of students who attended online classes, 61% (adjusted for multiple responses) reported using Facebook Live for online classes (See [Annex 2, Table A22](#)).

4.3.4 Access to schooling during the pandemic

During the pandemic, access to schooling took three forms: in-person, online, and tech-based education. The survey findings showed that 63.24% of respondents were able to attend classes (i.e., any classes) during the pandemic (Figure 7). However, this number decreases once this is limited to technology-based classes. About one-third of students who reported attending classes did so in-person, as the madrasahs continued to offer in-person classes throughout the pandemic instead of moving to online classes.

Figure 7. Class attendance during the pandemic.

Students attending government and NGO schools accessed class more often than students at private schools and madrasahs (Table 8). The lower attendance rates at private schools could be explained, as several reports have

done so, by the pandemic significantly inhibiting parents' ability to pay private school tuition fees. Regardless, this difference is not statistically significant.

Table 8. *Class attendance (physical or online) during pandemic by school type.*

Attended class (%)	Govt. school	Semi-govt. School	NGO school	Private school	Madrasah / religious school	Total
No	25.00	38.04	20.00	38.92	45.45	36.90
Yes	75.00	61.96	80.00	61.08	54.55	63.10
Total	100.00	100.00	100.00	100.00	100.00	100.00
Pearson chi2(4) = 5.9312 Pr = 0.204						

Similarly, NGO schools (70%) and government schools (75%) had higher rates of attendance with respect to online classes. However, there were only four government schools, which is a very small sample. In contrast, the samples for the other school categories were of a reasonable size (semi-government school⁸ — 8; NGO-funded school — 4; private school — 17; madrasah — 9). Madrasahs / religious schools lagged when it came to offering online classes. The difference in rates of attendance for online classes was also statistically significant.

Table 9. *Attendance of online classes by type of school.*

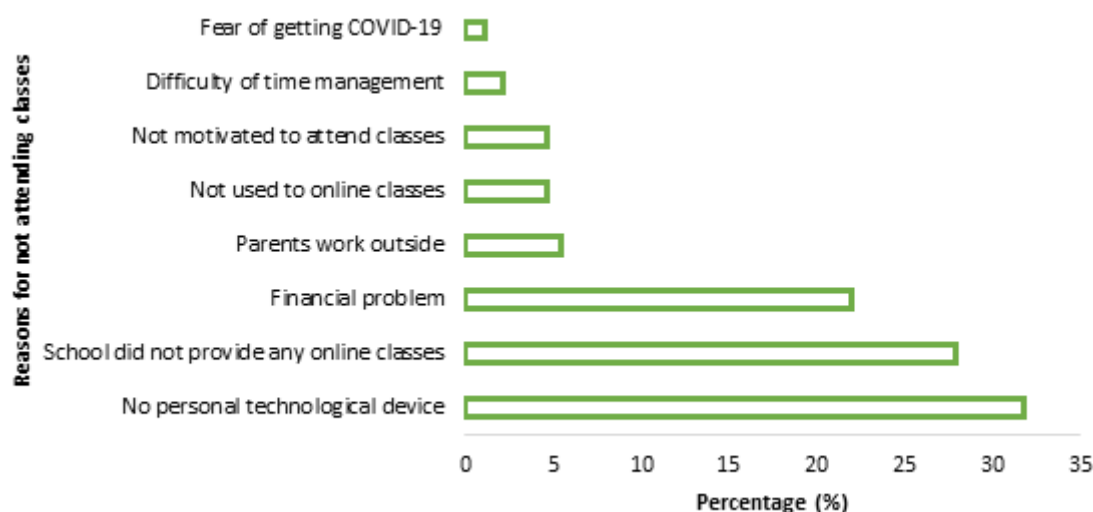
Type of school	No (%)	Yes (%)
Govt. School	25.00	75.00
Semi-govt. School	43.53	56.47
NGO School	30.00	70.00
Private School	85.80	14.20
Madrasah / Religious School	100.00	0.00
Total	58.46	41.54
Pearson chi2(4) = 98.4208 Pr = 0.000		

A higher proportion of male compared to female respondents attended online classes, with the difference between these groups being statistically significant ($\chi^2 = 7.96$, $p < 0.01$). This supports this study's earlier finding that female

⁸ These are government-aided schools which are run by the private sector.

students had lower access to technological devices and the internet compared to their male counterparts. The most cited reasons for not attending any online classes were the lack of a personal tech device (31.72%), no online classes offered by the school (27.88%), and financial barriers (22.01%) (Figure 8).

Figure 8. *Reasons for not attending any classes during the pandemic.*



The findings suggest that having access to technological devices is positively correlated with attending classes. Whereas 90% of respondents with access to technological devices reported attending classes, only 39% of respondents who lacked access to such devices reported doing so (either tech-based or in-person classes). Moreover, 90% of respondents who owned technological devices reported that they had attended classes using a technological device, while only 15% of respondents with no access to technological devices were able to do so. This difference was statistically significant, even at a 1% level of significance ($\chi^2 = 276.47, p < 0.0001$). Conversely, no statistically significant difference was observed across income groups with regard to online class attendance.

Even though no significant differences were observed among students from different years with regard to class attendance (both in-person or online), a significant difference was observed when the analysis was controlled to focus only on online class attendance ($\chi^2 = 33.53, p < 0.0001$). Specifically, access to online classes was directly correlated to student cohorts — students in the higher-grade classes had greater access to online classes than students in lower grades. It would appear that parents focused their resources on ensuring that their older children had the most access to online education.

4.4 Regression results

The above discussion was mostly based on descriptive statistics and limited level statistical tests. Unfortunately, it is not possible to control for certain confounders in such analyses. Hence, regressions were employed to develop a better understanding of how various factors influence technological device ownership and access to education. Table 10 lists the various determinants and their impacts on tech device ownership and access to tech-based education identified in this analysis.

4.4.1. Determinants of tech device ownership

Students studying in upper years had better access to technological devices (odds ratio > 1), and this relationship was found to be highly significant (significant at 1% level of significance). Elsewhere, female students tended to have lower access to technological devices for educational purposes compared to their male counterparts. The odds of female students having access to a technological device was 0.66, which is statistically significant, though only at the 10% level. No other cluster effects were found to be relevant, and only very weak income effects were observed. Parents education levels⁹ were also found to be non-significant in determining tech device ownership.

4.4.2. Determinants of access to tech-based education

Having access to technological devices appeared to be positively correlated with access to tech-based education. Students who had access to technological devices were 54 times more likely to access online classes compared to those who did not. In addition, grade level was also found to be a relevant factor, with students in upper grades having greater access to online education. Once again, however, female students were significantly less likely to have access to online education. As expected, having access to the internet was positively correlated with access to online education, although no income effects were observed with respect to access to online education.

⁹ Information was only available for the parents of 48 students. Thus, including this variable significantly reduced the observation in regressions; instead, it is included in the main regression. However, when this variable was included, it was found to be insignificant.

Table 10. Odds ratio from logit regression.

	(1)	(2)
	Tech_Device_Ownership	Access_to_Online_Class
Class of study	1.438*** (0.158)	2.148*** (0.391)
Age	0.957 (0.087)	0.595*** (0.088)
Involved in job	1.084 (0.485)	0.503 (0.360)
Female	0.665* (0.140)	0.506** (0.168)
Income groups		
Poor	1.565* (0.406)	0.895 (0.374)
Rich	1.327 (0.346)	0.915 (0.388)
Richest	1.355 (0.412)	0.817 (0.397)
Cluster / area		
Bou bazar	0.586* (0.181)	0.429* (0.206)
Jamai bazar	0.693 (0.212)	0.722 (0.349)
Sonar Bangla	1.032 (0.345)	0.728 (0.372)
Owns technological devices for educational purposes		55.398*** (21.380)
		2.469** (1.093)
Observations	474	474
Pseudo R2	0.067	0.540
	(1)	(2)
	Mobile Device Ownership	Access to Online Class

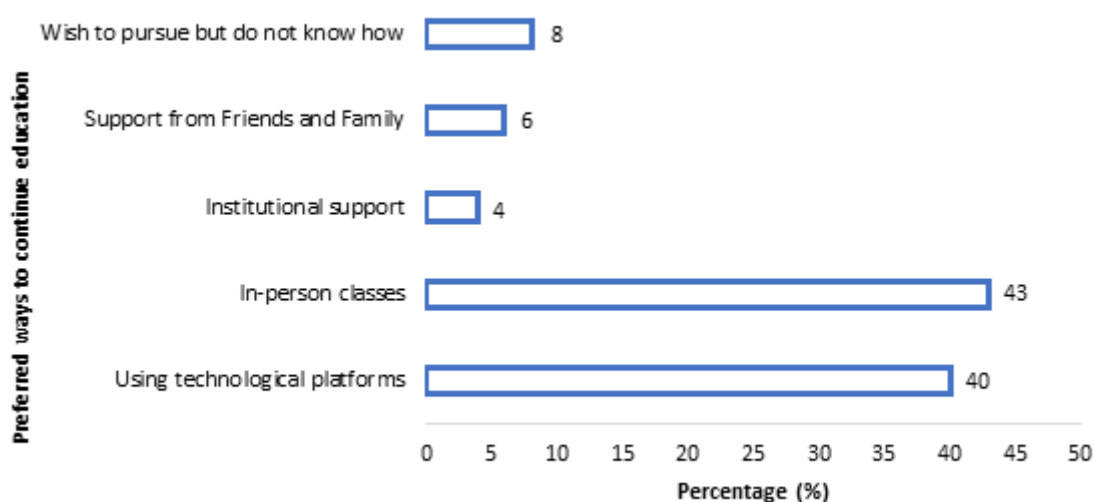
Marginal effects Exponentiated coefficients (Odds ratio); Standard errors in parentheses
 * $p < .10$, ** $p < .05$, *** $p < .01$

The results of the descriptive and regression analyses suggest that access to a tech device is paramount for accessing online classes. As the findings indicate, having access to a technological device is associated with attending classes (both physical and tech-based), and is highly correlated with access to online classes. In particular, owning a smartphone appears to be highly relevant in this case.

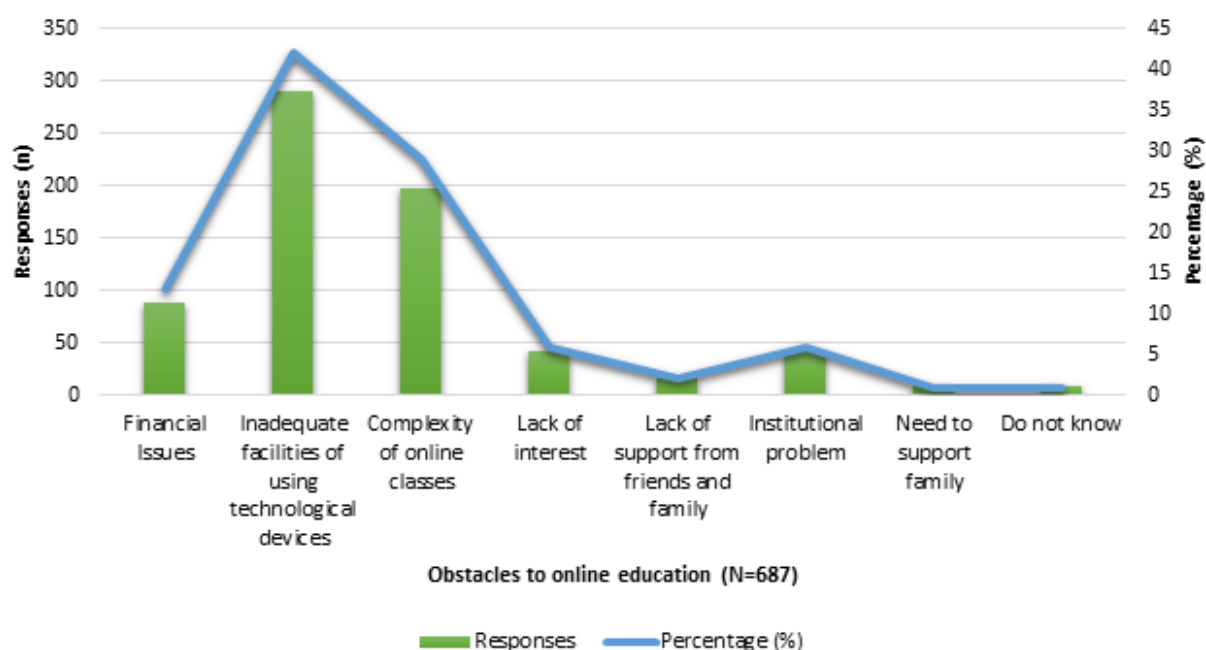
4.5 What next if the pandemic continues?

Most survey participants (97.27%) expressed the desire to continue their education in the future. The respondents were allowed to answer openly about exactly how they wanted to continue their education if the pandemic continued, with most indicating a preference for both in-person and technology-based education. With respect to continuing their education via technological modalities, many respondents (40%) expressed a desire to do so using tech-based platforms like Facebook, YouTube, Zoom, and Google Meet. Interestingly, 43% of the respondents said they would like to continue their education via in-person classes (Figure 9).

Figure 9. *How the students want to continue classes in future.*



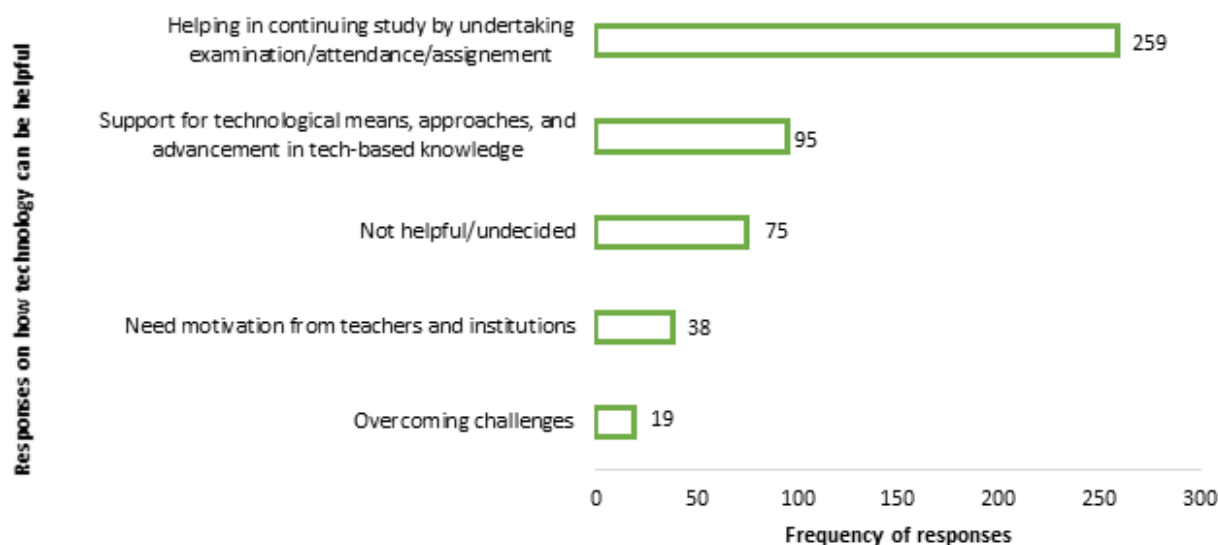
There are numerous reasons why some children might prefer in-person classes over technology-based education. For instance, 42% of respondents identified inadequate tech facilities as the main barrier to tech-based education, while 29% cited the complexities of online classes (Figure 10, below) as the primary obstacle. These barriers are directly connected to family financial problems (13%) and institutional inadequacy (6%). Notably, a small group of respondents expressed simply having no interest in tech-based education (6%).

Figure 10. *Challenges of tech-based education.*

In one of the open-ended questions asked in the survey, a proportion of respondents indicated that they would not continue their studies unless they were able to participate in in-person courses. These findings imply that the risk of dropout may increase if the pandemic —and online classes — persist. Conversely, a proportion of respondents said that they would like to see a hybrid approach to education wherein tech-based classes are supplemented by in-person schooling and learning.

Despite facing obstacles, a significant number of respondents believed that having access to technological devices could help them continue their studies during and after the pandemic. They gave the opinion that advancements in technological knowledge and greater support for technological means and approaches can be helpful in this regard (Figure 11).

Figure 11. Responses on how technological devices can be helpful (now and in the future).



4.6 Discussion

This research examined Korail students' degree of access to technological devices and the factors that have influenced access to such devices and tech-based education during the pandemic. The findings of this study both support and diverge from those of previous studies.

The most surprising finding of this study is that more than three-quarters of households in Korail have at least one smartphone, compared to the national average of 41% ([↑GSMA, 2021](#)). This finding challenges the conventional notion that slum dwellers lack access to technological devices. One possible explanation for this finding may be that the participants in this study, who were all from low-income households, opted for more inexpensive smartphones (or other devices) and phone plans.

Additionally, the findings revealed that while 85.16% of households surveyed owned a television (nearly double the national average in Bangladesh) ([↑NIPORT & ICF, 2019](#)), this did not translate into its use by students to participate in the Government of Bangladesh's TV-based learning programme which was launched at the start of the pandemic. Only one-fifth of respondents reported watching or participating in the Government of Bangladesh's televised educational programming. This lag in participation may be due to unawareness on the part of Korail residents regarding the role that television can play in education. The disparity in the respondents' use of television and smartphones to access education may also suggest that

students prefer interactive online platforms over non-interactive televised programmes. Data collected for this study would appear to support this, with students preferring interactive platforms such as Facebook and Youtube — mainly accessed through their smartphones — over non-interactive modalities like television. This would support findings from a study undertaken by [↑Rahman et al. \(2021\)](#), which concluded that a large part of student dissatisfaction with online classes stemmed from the lack of interaction with their teachers.

Contextual and proximate factors undermining children's access to education were identified by [↑Raha et al. \(2021\)](#) and include a lack of resources (e.g., not having enough mobile devices in the household, inadequate and costly internet connection etc.) and scheduling conflicts between TV classes and other programmes watched by family members. Our findings also identified these factors as key factors accounting for the lack of participation in education over the Covid-19 period.

4.7 Conclusion

This analysis has examined the state of secondary students' use of technological devices to access education during the pandemic, and the factors influencing their access to such devices. The findings of this study reveal that having access to a digital device is associated with higher rates of attendance to online education. The findings also showed that the households in the Korail slum own a variety of technological devices, including televisions, smartphones, and computers, which means that students in Korail have the opportunity to participate in tech-based education. However, despite this abundance of technological devices, only about half of participants reported attending online classes during the pandemic.

5. Policy implications

The findings of this study revealed various challenges that secondary students living in the Korail slum face in using their technological devices to access online education. Overcoming these challenges will be essential if these students are to realise the benefits of using technology to support their education. This section presents potential policy-based solutions that might be considered in addressing these challenges.

5.1 Raise awareness around the importance of digital solutions and their potential role in assisting with learning

The transition from in-person to online education during the pandemic introduced a new approach to learning for students living in the Korail slum. Our findings show that despite high levels of device ownership, device usage for educational purposes was much lower. These low levels of usage appear to be driven by a lack of knowledge, trust, and parental permission in relation to technology-supported learning. This underscores the importance of creating awareness around the potential role of technology in assisting with learning. To address this, government and education partners should consider developing awareness-raising campaigns to increase parental enthusiasm around the use of technology in learning. These campaigns should engage with various educational stakeholders, including school-level actors and NGOs working in the slums.

5.2 Support the most effective use of existing technologies and infrastructure by considering learner preferences

Our findings concluded that, while the majority of surveyed households owned a television, they were used for educational purposes much less frequently than smartphones. One major reason for this disparity could be a lack of parental / caregiver / student knowledge that television can be used to support education continuity. This insight provides a crucial lesson for policymakers. Firstly, policymakers must evaluate the pros and cons of all modalities used in their multimodal strategy to provide online classes during Covid-19. The context of the students must also be taken into account when evaluating their experiences of using these devices, and what aspects make certain devices more or less appealing. Secondly, future design of programmes that use technology for education must include the end-user — in this case, the student

— in the design process. Such an approach would incorporate specific user needs and account for issues beyond physical access to devices.

5.3 Determine household and community dynamics that affect access and use of technology by learners

The survey results showed that when it came to access, girls and learners in lower grades had less access to technology compared to boys and learners in higher grades. Policymakers and researchers need to invest in understanding the various challenges different groups of learners face in accessing and using technology for their educational needs. Determining what accounts for these different challenges and whether they are uniform across different types of technological devices is important. With technology becoming an integral part of education systems worldwide, including Bangladesh, policymakers must ensure that the most marginalised groups are not left behind or the divide in educational outcomes between those who do / do not have access to devices is not widened further. When it comes to gender, for example, girls in Bangladesh far outperform boys with respect to accessing and completing primary and secondary education. Thus, policymakers must ensure that a greater reliance on technology does not reverse this progress given that girls' access to technology is more limited compared to boys.

5.4 Capacity building for learners

The sudden change in the educational system has been challenging for the students living in Korail slum. Many of the students could not attend online classes because they lacked the necessary technical knowledge to use technological devices for educational purposes. This highlights the limited capacity of learners to adapt and adjust to such a quick change in the educational landscape. As such, government institutions and education partners should provide capacity building training for students in slum contexts.

6. Conclusion

This quantitative survey of secondary level students living in Korail slum has explored the state of accessing technological devices and associated factors that influenced such access for education during the pandemic. The findings state that almost half of the students accessed education through various technological modalities. Those who participated in education mainly did this using smartphones and television. However, this study found a gap existed between ownership of devices and their utilisation for educational purposes. The majority of households surveyed owned devices like television and smartphones. However, around half of the students did not participate in educational activities using these modalities.

Various underlying factors influenced students' access to technological devices to be able to continue with their online education. The lack of affordable and good internet connection, for instance, was a mitigating factor when it came to device ownership and use. Similarly, students in higher grades were more likely to be able to access devices compared to students from lower grades. The lack of permission from parents to use technological devices was another factor influencing their access to online education. This study has made some policy suggestions for better integration of devices in tech-based education. These include raising awareness around the use of devices in accessing education, factoring in learner preferences when it comes to the most effective use of technology and investing more in understanding why certain students are likely to be excluded from accessing devices compared to others.

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Annex 1: Survey Questionnaire

It should be noted that the consent forms and survey questionnaire were administered in Bangla, but for the purposes of this report have been translated into English.

Consent Form for Parents / Guardian

Greetings!

I am [Name of data collector], a data collector for research commissioned by an organisation named “Beyond Peace”. As a part of our research, titled ‘Integration of Technology in Education for Marginalised Children in Korail Slum of Dhaka City during the COVID-19 Pandemic’, Beyond Peace is conducting a survey on school-going children of Korail slum regarding their access to education and accessing education through online during the pandemic by using technological devices.

Expectations of the researcher: As a part of this research process and to carry out the survey in Korail slum, I have arrived at your household to collect data. The primary purpose is to seek your permission to collect some basic household information and your permission to allow your school-going children to participate in the survey. The researcher expects to collect some basic information about your household circumstances, and to ask your children about his / her basic information, access to education in the pre-pandemic and during the pandemic condition, their concerns, and recommendations to continue online education if the pandemic continues.

Background of the study: With the advent of the Covid-19 pandemic, nearly all forms of educational institutions in Bangladesh are closed and digital education has become the norm ever since. For many children of Bangladesh, accessing this form of education was difficult and challenging. This study solely focuses on the children of Korail slum in order to understand their status of education during the pandemic, and all forms of challenges and issues they face when it comes to accessing online education through different mobile devices. Data that will be collected through this survey will be used for this study. The findings will be shared in different conferences and will hopefully be useful for policymakers and academics to undertake appropriate measures to offer education to less privileged children living in slums and to conduct further studies.

Ethics and Confidentiality: All the questions will be explained properly to you and your children before answering them. Any kind of potential harm (physical, psychological, or social) will be avoided that may arise from the research. The researcher is ensuring you that the given information will be maintained, stored and used by following ethical principles and full confidentiality. Complete anonymity will be given to your identification; therefore, nowhere your identification will be shared in the study report.

How your information will be used: The data collected from this survey will be ethically processed, stored, and used for the purpose of this study. Once data analysis is done, survey findings will be shared and discussed in conferences related to wider

aspects of this research project. The findings of this study will offer a pathway to the betterment of online education for children of marginalised communities living in slums. These study findings will help educationalists and policymakers to make better decisions to ensure education for all children. All the personal data related to this study will be discarded once the project ends.

Rights of the interviewee: We hope that your participation will enrich the findings of this research. As a participant of this survey, you, however, have all rights to abstain from this research if you feel uncomfortable. You also have the right not to answer any question at any stage of the survey. Your participation is in this study; hence, nothing will be charged if you abstain or withdraw from the survey process at any stage.

If you have read / listened to the entirety of the consent form, please tick the following statements as appropriate for you.

I have read and understood the information on the informed consent letter.

I understand who will have access to the data collected during the study.

I understand how personal data will be stored and what will happen to the data at the end of the study.

I understand that the research will be written up as a study report and used for presentations at conferences and for future research.

I consent to be a participant in this survey having fully understood my rights as a participant in this study

Now, we are asking for your valuable consent to participate in this study, and to give permission to your child to participate in this survey. If you are satisfied, please sign below.

.....

Parents' / legal guardian's signature with date

Data collector's name & signature with date

Survey administered to parent / guardian of the student respondent

I. Household Roster (Questions to the parent / guardian of the student respondent)										
1. Cluster name	A. Beltola		B. Bou Bazar		C. Jamai Bazar		D. Sonar Bangla			
2. The number of household members										
3. Please specify the following details on all the household members. (Information for the data collector: List the members according to their age; with the oldest at the top and youngest at the bottom)										
List of Members	Age	Gender	Educational qualification	Relationship with the respondent	Occupation	Is the person an earning member? If Yes---->	Estimated monthly income (BDT)	Is he / she receiving education during the pandemic?	Was he / she receiving education before the pandemic?	Owns mobile devices
		A. Male B. Female C. Others	A. University Degree B. HSC Pass or equivalent / studying C. SSC Pass or equivalent D. Primary School or Madrasah (PSC or equivalent) / E. Technical or other similar education (Specify) F. No Formal Education	A. Parents B. Sibling C. Uncle / Auntie D. Cousin E. Grandparent F. Respondent himself / herself G. Other (Specify down below)	A. Government Job B. Non-government job C. Factory worker or construction worker D. Small Business E. Local Leader F. Rickshaw or Van driver G. CNG or car driver H. Garments worker I. Day labourer J. Shop-keeper		A. 0-5000 B. 5,001-10,000 C. 10001-20000 D. 20001-30,000 E. 30,001-40,000 F. More than 40000	(If aged between 5-18 years old) A. Yes B. No [If Yes, insert the class he / she study in]	(If aged between 5-18 years old) A. Yes B. No [If Yes, insert the class he / she study in]	(e.g., mobile phone, tablets, etc.) A. Yes B. No

					K. Hawker L. Bus or other vehicle helper M. Boatman N. Cleaner or sweeper O. Housemaid P. Housewife Q. Unemployed R. Other.....						
4. To have a better understanding of your access to technology, please tell us what kind of digital devices / assets do you have? [Mark all that apply]											
A. Television (LCD / LED)			B. Radio		C. Smartphone		D. Tablets		E. Smartwatch		
F. Desktop Computer			G. Laptop		H. Wi-Fi connection		I. None		J. Others (please specify)		
5. To have a better understanding of your economic condition, please tell us what kind of non-tech household assets do you have? [Mark all that apply]											
A. Motorcycle		B. CNG Auto-rickshaw			C. Rickshaw			D. Boat		E. Cycle	
F. Fan		G. Fridge			H. Furniture (e.g., wooden or steel chair and tables)			I. None		J. Others (please specify)	

Consent Form for Participating Student

Greetings!

I am [Name of data collector], a data collector for research commissioned by an organisation named “Beyond Peace”. As a part of our research, titled ‘Integration of Technology in Education for Marginalised Children in Korail Slum of Dhaka City during the COVID-19 Pandemic’. Beyond Peace is conducting a survey on school-going children of Korail slum regarding their access to education and access to education online during the pandemic by using technological devices.

We have already talked to your parents / guardians and they consent to you participating in this survey. This survey is part of research that aims to understand the status of online education of children of Korail slum. We hope that you will take part in this study. If you participate in it, we will ask you some questions about your basic information, your status of education before and during the pandemic, and also about your access to online education. We will use this information for research purposes only. All the questions will be explained to you properly before you answer them. You can choose not to answer any of the questions. With your valuable information, we hope to create a pathway to better the status of online education in Korail slum.

Now, If you have read / listened to the entirety of this consent form and have no further questions; please tick the following statements if they are true for you.

I have read and understood the information on the informed consent letter

I understand who will have access to the data collected during the study

I understand how personal data will be stored and what will happen to the data at the end of the study

I understand that the research will be written up as a research study, and used for presentations at conferences and for future research

I consent to be a participant in this study having fully understood my rights as a participant in this study

Now, we are asking for your permission to begin this survey with you. If you agree, then please sign down below (handwritten name will also suffice),

Respondent student’s signature with date

Data collector’s name and signature with date

Survey administered to student

I.	II. Basic information of the Respondent (To the student respondent)				
6. Which class do you study in and what is your age and gender?	Class:		Age:	Gender:	
7. What is the name of your educational institution?					
8. Are you currently involved in any job?	A. Yes		B. No		
9. If Yes, specify what kind of job it is.	A. Apprenticeship Paid Unpaid	B. Non-government job Paid Unpaid	C. Factory worker Paid Unpaid	D. Business assistant Paid Unpaid	E. Political activist Paid Unpaid
	F. CNG, car or bus driver Paid Unpaid	G. Rickshaw or van driver Paid Unpaid	H. Boatman Paid Unpaid	I. Garments worker Paid Unpaid	J. Day labourer Paid Unpaid
	K. Shop-keeper / Shop assistant Paid Unpaid	L. Hawker Paid Unpaid	M. Other (Specify) Paid Unpaid		

I. Access to Technological devices and the internet (To the student respondent)		
10. Do you use any technological devices for educational purposes?	A. Yes	B. No
11. If No, specify the reason behind it. [Mark all that apply] Doesn't apply	A. Lack of an appropriate number of technological devices to share B. Lack of trust from the parents for using technological device C. Lack of knowledge about how to use such devices D. Lack of permission from parents to use E. Lack of interest from the child to use F. Financial hardship G. Others (Please Specify)	
12. If Yes, specify the device(s) you use for this purpose? [Mark all that apply]	A. Smartphone B. Tablet C. Feature Phone / Button Phone D. Laptop	

Doesn't apply		E. Desktop Computer F. Pocket Radio G. Television H. Others (Please Specify)	
13. How much time do you spend on these devices per day for educational purposes? (Only answers for the devices that you actually use) Doesn't apply	A. Smartphone	1. Less than an hour, 2. One to two hours, 3. Two to three hours, 4. Three to four hours, 5. Four to five hours, 6. More than five hours	
	B. Tablet	1. Less than an hour, 2. One to two hours, 3. Two to three hours, 4. Three to four hours, 5. Four to five hours, 6. More than five hours	
	C. Feature Phone / Button Phone	1. Less than an hour, 2. One to two hours, 3. Two to three hours, 4. Three to four hours, 5. Four to five hours, 6. More than five hours	
	D. Laptop	1. Less than an hour, 2. One to two hours, 3. Two to three hours, 4. Three to four hours, 5. Four to five hours, 6. More than five hours	
	E. Desktop Computer	1. Less than an hour, 2. One to two hours, 3. Two to three hours, 4. Three to four hours, 5. Four to five hours, 6. More than five hours	
	F. Pocket Radio / Radio	1. Less than an hour, 2. One to two hours, 3. Two to three hours, 4. Three to four hours, 5. Four to five hours, 6. More than five hours	
	G. Television	1. Less than an hour, 2. One to two hours, 3. Two to three hours, 4. Three to four hours, 5. Four to five hours, 6. More than five hours	
	H. Other	1. Less than an hour, 2. One to two hours, 3. Two to three hours, 4. Three to four hours, 5. Four to five hours, 6. More than five hours	
14. What other purposes do use this device(s) for? [Mark all that apply] Doesn't apply	A. Social media B. YouTube C. Listening music D. Downloading and watching videos E. Photography F. Communication via call and SMS G. Reading newspaper H. Others (Please Specify)		
15. Do you have access to the internet for your lessons regularly?	A. Yes	B. No	
16. If Yes, what kind of internet connection do you use? [Mark all that apply] Doesn't apply	A. Broadband B. Wi-Fi (Family owned) C. Wi-Fi (Shared with neighbour / another family) D. Mobile Data internet E. Others (Please Specify)		

17. If No, specify the reason(s) behind not using the internet. [Mark all that apply] Doesn't apply	A. Financial hardship B. Lack of available Wi-Fi provider C. Poor internet connection D. No smartphone / laptop / tab available E. I work outside F. Parent's unwillingness G. Do not need to use H. Do not know I. Others (Please Specify)	
18. Do you have access to electricity in your house?	A. Yes	B. No
19. If Yes, how many times does a power outage happen in your house per day on average? Doesn't apply	A. Less than an hour B. Two hours C. Three hours D. Four to six hours E. Seven to ten hours F. More than ten hours G. Never happens	
20. Does a power outage hamper your access to digital education?	A. Yes	B. No
I. Access to Education in Pre-Pandemic Period (To the student respondent)		
21. How often did you attend the classes before the pandemic?	A. Every day B. Missed only around four or five classes per month C. Missed around two or three classes every week D. Seldom appeared in classes (less than four times per week) E. Barely attended classes (less than four times per month) F. Hardly ever attended classes (missed months of classes)	
22. Were there any kinds of digital education systems in your educational institution before the pandemic?	A. Yes	B. No
23. If yes, tell us what kind of digital education system did you use before the pandemic? [Mark all that apply] Doesn't apply	A. Online class via zoom, Facebook live or any other similar modalities B. Lessons via projectors or any kind of electronic devices in the classroom C. Use of social media platform to deliver study materials (e.g., syllabus, study notes etc.) D. Lessons from educational YouTube channels or Facebook groups E. Lessons offered / telecasted through national television channel. F. Others (Please Specify)	
24. Did you attend any coaching centre / private tuition outside of your school / madrasah?	A. Yes	B. No

25. Did you change your school / madrasah because of the pandemic?	A. Yes	B. No
26. If Yes, why did you change it? [Mark all that apply] Doesn't apply	A. Financial reasons B. Lack of classes C. Fear of the pandemic D. Personal reasons (e.g., distance from my house, disinterest in study, etc.) E. Do not wish to answer F. Other reasons (Please Specify)	

I. Access to Education during the Pandemic (To the student respondent)			
27. Throughout the pandemic in 2020-21, have you attended any classes provided by your educational institution?	A. Yes		B. No
28. If Yes, how did you attend those classes? Doesn't apply	A. Via Online through mobile device(s)	B. In person	C. Other ways (Specify how)
29. If No, why did you not attend the classes? Doesn't apply	A. Financial reason B. Difficulty with time management C. My parents go outside and carries their mobile phone with them D. No personal smartphone / laptop / tablet / desktop computer E. I work outside during the class time F. I am not motivated to attend online classes G. I do not like / understand online classes H. Due to fear of Covid-19 I. No online classes were provided by my institution J. Others (Please Specify)		
30. Did the teachers of your school / madrasah contact you about your education?	A. Yes		B. No
31. If Yes, how did they contact you? [Mark all that apply] Doesn't apply	A. Voice call B. SMS C. WhatsApp messages D. Facebook messenger E. Email F. Face to Face G. Others (Please Specify)		
32. Were you tasked with some kind of assignment or lesson exercise by your educational institution to do at home?	A. Yes		B. No

33. If Yes, how did you complete them? [Mark all that apply] Doesn't apply	A. With the guideline provided by the school / madrasah B. With the help of my teachers provided in online C. With the help of friends / classmates D. With the help of family members (e.g., parents, siblings) E. With the help of online educational channel / group on YouTube and Facebook F. With the help of educational television program G. All by myself H. I actually didn't complete them I. Others (Please Specify)				
34. Do you currently attend any coaching centre / private tuition outside of the school / madrasah?	A. Yes		B. No		
35. If Yes, specify how do you attend these classes? Doesn't apply	A. Via Online	B. In person	C. Other ways (Specify how)		
36. Since when have you been attending these classes outside the school / madrasah? [Specify the time period] Doesn't apply	A. Sinc e the beg - inni ng of the pan de mic	B. After six months of the beg- inning of the pan- demic	C. Since last six months	D. Recently started	E. Don't remember the exact time
37. Is your educational institution or your teacher using any kinds of technological modalities or online platforms to deliver education during this pandemic?	A. Yes		B. No		
38. If Yes, specify what kind of technological education system? [Mark all that apply] Doesn't apply	A. Online class via Facebook live or any other similar modalities B. Lessons via voice calls C. Lessons via google classroom, zoom, or similar modalities D. Use of social media platform to deliver study materials E. Sending reading materials via email F. Others (Please Specify)				
39. Do you find it difficult or challenging to take part in any kinds of online classes from your school / madrasah?	A. Yes		B. No		

40. If Yes, tell us the reasons. [Mark all that apply] Doesn't apply		A. Finds them too complex to comprehend B. Lack of proper access to the internet C. Lack of access to mobile devices D. Lack of motivation and interests E. Financial issues F. Have to spend time for the family (e.g., household work, taking care of siblings etc.) G. Others (Please Specify)			
41. Besides the lessons from your school / madrasah, are there any forms of digital modalities that you're using during this pandemic for your educational purposes?		A. Yes		B. No	
42. If No, why? [Mark all that apply] Doesn't apply		A. Unaware of such services B. Lack of proper access to the internet C. Lack of proper access to mobile devices D. Lack of motivation and interest E. Others issues (Please Specify)			
43. If Yes, tell us more about these modalities and platforms that you have been using or have used during the pandemic. [Mark all that apply] Doesn't apply		A. Educational programs offered by various television channels B. Lessons from educational YouTube channels C. Lessons from educational Facebook groups D. Various educational websites E. Online newspaper education sector F. Others (Please Specify)			
44. Which platforms do you find suitable and useful for your educational use? [Mark all that apply]		A. TV educational programs B. Lessons from educational YouTube channels C. Lessons from educational Facebook groups D. Various educational websites E. Online newspaper education sector F. Lessons in Zoom, Google meet or similar modalities G. Online class via Facebook live or any other similar modalities H. Lessons via voice calls I. Use of email to send study material J. None H. Others (Please Specify)			
45. How useful do you think they are for you?					
A. Very Useful	B. Somewhat Useful	C. Undecided	D. Not useful	E. Don't know	
46. How did you come to know about these digital modalities? [Mark all that apply]					
A. Friends from school / madrasah	B. Family / Neighbours	C. Teacher	D. School authority	E. Government declaration	F. Others (Please specify)

VI. Final Opinion and Recommendation (To the student respondent)

47. If the pandemic continues and your educational institution does not reopen anytime soon, how do you wish to pursue your education?

A. I do not wish to pursue education (If so, explain why)

B. I wish to pursue education (If so, explain how)

48. Tell us what you think are the main challenges that stand in your ways of accessing online education.

49. Please explain how differently online platforms can help your education now and in the future.

Annex 2: Quantitative data

Table A1. Frequency of usage of device per day.

	Smartphone		Laptop		Desktop		Radio		Television		Others	
	N	%	N	%	N	%	N	%	N	%	N	%
Less than an hour	74	33.48	3	37.50	1	33.33	1	100.00	3	61.29		
One hour	90	40.72	5	62.50	1	33.33			19	30.65		
Two hours	42	19.00							5	8.06	1	100.00
Three hours	9	4.07			1	33.33						
Four hours	5	2.26										
More than five hours	1	0.45										

N= Frequency

Table A1.1. Access to technological devices for educational purposes (by income category)

	Poorest	Poor	Rich	Richest	Total
No	60.28	44.62	50.78	51.28	51.99
Yes	39.72	55.38	49.22	48.72	48.01

Pearson chi2(3) = 6.8088 Pr = 0.078

Table A1.2. Access to technological devices for educational purposes (by income category)

	Beltola	Bou bazar	Jamai bazar	Sonar Bangla	Total
No	45.59	57.89	54.72	43.30	52.10
Yes	54.41	42.11	45.28	56.70	47.90

Pearson chi2(3) = 6.6476 Pr = 0.084

Table A1.3. *Time spent (in hours) on various devices*

	Time spent (in hours)					
	<1	1 – <2	2 – <3	3 – <4	4 – <5	5+
Smartphone	63.25	78.26	87.50	90.00	100.00	100.00
Tablet	2.56	4.35	0.00	0.00	0.00	0.00
Feature phone	0.85	0.87	0.00	10.00	0.00	0.00
Laptop	0.85	0.00	0.00	0.00	0.00	0.00
Desktop	32.48	16.52	10.42	0.00	0.00	0.00
Television	0.00	0.00	2.08	0.00	0.00	0.00

Table A1.4. *Internet access (for education) by income category (%)*

	Yes	No	Total
Poorest (%)	46.81	53.19	100.00
Poor (%)	30.77	69.23	100.00
Rich (%)	28.13	71.88	100.00
Richest (%)	29.49	70.51	100.00
Total	34.59	65.41	100.00

Table A1.5. *Time spent on smartphones for educational purposes (by gender).*

	Time spent (in hours)					
	<1	1 – <2	2 – <3	3 – <4	4 – <5	5+
Male (%)	30.59	37.65	23.53	4.71	3.53	0.00
Female (%)	35.29	42.65	16.18	3.68	1.47	0.74
Total (%)	33.48	40.72	19.00	4.07	2.26	0.45

Table A1.6. *Time spent watching TV for educational purposes (by gender).*

	Time spent (in hours)		
	<1	1 – <2	2 – <3
Male (%)	56.52	30.43	13.04
Female (%)	64.10	30.77	5.13
Total (%)	61.29	30.65	8.06

Table A1.7. *Time spent on smartphones for educational purposes (by cluster).*

	Time spent (in hours)					
	<1	1 – <2	2 – <3	3 – <4	4 – <5	5+
Beltola (%)	35.14	37.84	16.22	2.70	8.11	0.00
Bou Bazar (%)	43.10	36.21	12.07	5.17	3.45	0.00
Jamai Bazar (%)	23.61	38.89	30.56	5.56	0.00	1.39
Sonar Bangla (%)	35.85	49.06	13.21	1.89	0.00	0.00
Total (%)	33.64	40.45	19.09	4.09	2.27	0.45

Table A1.8. *Time spent watching TV for educational purposes (by cluster).*

	Time spent (in hours)		
	<1	1 – <2	2 – <3
Beltola (%)	50.00	33.33	16.67
Bou Bazar (%)	60.87	34.78	4.35
Jamai Bazar (%)	60.87	26.09	13.04
Sonar Bangla (%)	70.00	30.00	0.00
Total (%)	61.29	30.65	8.06

Table A1.9. *Time spent on smartphones for educational purposes (by income group).*

	Time spent (in hours)					
	<1	1 – <2	2 – <3	3 – <4	4 – <5	5+
Poorest (%)	35.19	44.44	18.52	1.85	0.00	0.00
Poor (%)	32.39	42.25	19.72	4.23	1.41	0.00
Rich (%)	38.98	27.12	18.64	8.47	5.08	1.69
Richest (%)	24.32	54.05	18.92	0.00	2.70	0.00
Total (%)	33.48	40.72	19.00	4.07	2.26	0.45

Table A1.10. *Internet access (for education) by income groups (%).*

	No	Yes	Total
Poorest (%)	46.81	53.19	100.00
Poor (%)	30.77	69.23	100.00
Rich (%)	28.13	71.88	100.00
Richest (%)	29.49	70.51	100.00
Total (%)	34.59	65.41	100.00

Table A2. *Time spent on online activities.*

Purpose	Frequency	% Responses	% (of cases): multiple-response-adjusted
Social media	94	31.33	9.96
YouTube	220	73.33	23.31
Music	209	69.67	22.14
Videos	111	37.00	11.76
Photography	169	56.33	17.90
Communication	118	39.33	12.50
Newspaper	23	7.69	2.44
Playing games	35	7.35	2.33

Table A3. Reason for not having internet access.

	Frequency	%
Financial hardship	109	67.28
Lack of Wi-Fi	46	28.40
Poor connection	6	3.70
No devices	110	67.90
Work outside	1	0.62
Parent unwilling	18	11.11
No use	28	17.28
Don't know	10	6.29

Table A4. Attended coaching / private tuitions.

	Frequency	%
Yes	365	76.68
No	111	23.32

Table A5. Changed school / madrasah during the pandemic.

	Frequency	%
Yes	45	9.45
No	431	90.55

Table A6. Changed school / madrasah during the pandemic.

	Frequency	%
Financial reasons	9	22.50
Lack of classes	6	15.00
Fear of getting Covid-19	10	25.00
Personal reasons	9	22.50

Table A7. *Reasons for not attending classes.*

	Frequency	%
Financial problems	60	35.50
Shortage of time	4	2.33
Lack of access to mobile	15	8.72
Does not have own device	88	51.16
Works during class time	2	1.16
Does not have interest	12	6.98
Not used to online classes	13	7.56
Fear of getting Covid-19	3	1.74
School did not take any online class	76	44.97

Table A8. *Modality used by teachers to make contact.*

	Frequency	%
Voice call	342	85.71
SMS	31	7.75
WhatsApp	15	3.75
Facebook messenger	24	6.00
In-person	100	25.00

Table A9. *Modality used to complete assignments.*

	Frequency	%
Guideline	105	24.82
Online help	41	9.72
Friends' help	134	31.75
Family help	25	5.92
Online educational channel help	56	13.27
Television programme help	10	2.37
Myself	173	41.00
Not complete	11	2.61
Other help	21	4.41

Table A10. *Attended coaching / private tuitions.*

	Frequency	%
Yes	365	76.68
No	111	23.32

Table A11. *Changed school / madrasah during the pandemic.*

	Frequency	%
Yes	45	9.45
No	431	90.55

Table A12. *Reason for changing school / madrasah during the pandemic.*

	Frequency	%
Financial reasons	9	22.50
Lack of classes	6	15.00
Fear of getting Covid-19	10	25.00
Personal reasons	9	22.50

Table A13. *Reasons for not attending classes.*

	Frequency	%
Financial problems	60	35.50
Shortage of time	4	2.33
Lack of access to mobile	15	8.72
Does not have own device	88	51.16
Works during class time	2	1.16
Does not have interest	12	6.98
Not used to online classes	13	7.56
Fear of getting Covid-19	3	1.74
School did not take any online class	76	44.97

Table A14. *Modality used by teachers to make contact.*

	Frequency	%
Voice call	342	85.71
SMS	31	7.75
WhatsApp	15	3.75
Facebook messenger	24	6.00
In-person	100	25.00

Table A15. *Modality used to complete assignments.*

	Frequency	%
Guideline	105	24.82
Online help	41	9.72
Friends' help	134	31.75
Family help	25	5.92
Online educational channel help	56	13.27
Television programme help	10	2.37
Myself	173	41.00
Not complete	11	2.61
Other help	21	4.41

Table A16. *Modality for attending classes.*

	Frequency	%
Online through mobile devices	199	66.11
In-person	102	33.88

Table A17. *Reasons for not attending classes.*

	Frequency	%
Financial problems	60	35.50
Shortage of time	4	2.33
Lack of access to mobile	15	8.72
Does not have own device	88	51.16
Works during class time	2	1.16
Does not have interest	12	6.98
Not used to online classes	13	7.56
Fear of getting Covid-19	3	1.74
School did not take any online class	76	44.97

Table A18. *Modality used by teachers to make contact.*

	Frequency	%
Voice call	342	85.71
SMS	31	7.75
WhatsApp	15	3.75
Facebook messenger	24	6.00
In-person	100	25.00

Table A19. *Modality used to complete assignments.*

	Frequency	%
Guideline	105	24.82
Online help	41	9.72
Friends' help	134	31.75
Family help	25	5.92
Online educational channel help	56	13.27
Television programme help	10	2.37
Myself	173	41.00
Not complete	11	2.61
Other help	21	4.41

Table A20. *Attended private coaching.*

	Frequency	Percentage	Cumulative
Yes	159	33.47	33.47
No	316	66.53	100.00

Table A21. *Modality of classes.*

	Frequency	%
Online through mobile devices	159	33.47
In-person	316	66.53

Table A22. *Modality used by teachers to conduct classes.*

	Frequency	%
Facebook live or any online modality	225	74.26
Voice call	28	9.24
Google classroom	74	24.42
Study materials	26	8.58
Email	1	0.33
Others	14	2.94

Table A23. *Problems with participating in online classes.*

	Frequency	%
Problems with understanding the classes	78	39.59
Internet issues	99	50.25
Lack of device	112	57.14
Lack of interest	33	16.84
Financial problems	82	41.84
Time for family members for earning and household chores	13	6.63
Other reasons	5	1.05

Table A24. *Use of other technological modalities other than those provided by school / madrasah.*

	Frequency	%
Yes	149	31.30
No	327	68.70

Table A25. *Reason for not using other technological modalities other than those provided by school / madrasah.*

	Frequency	%
No idea about other media	154	49.68
Internet issues	66	21.36
Lack of device	143	46.28
Lack of interest	76	24.60
Other	25	5.25

Table A26. *Preferred modality of use by respondents during pandemic.*

	Frequency	%
TV	110	27.57
YouTube channels	152	38.10
Facebook channels	118	29.57
Websites	49	12.28
Newspapers	13	3.26
Zoom / Google meet	117	29.32
Facebook live	118	29.57
Voice call	36	9.02
Email	6	1.51
No platform	29	7.27
Other	17	3.57

Table A27. *Source of information about digital media.*

	Frequency	%
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Friends	128	26.95
Family	108	22.74
Teacher	261	54.95
School	148	31.16
Government declarations	49	10.32
Others	12	2.52

Table A28. *Pre-pandemic use of technology in education.*

	Frequency	%
Online class	19	8.64
Classroom devices	209	95.00
Social media	6	2.74
Educational online media	6	2.71
TV channels	8	3.64

Table A29. *Ownership of devices by income category.*

Smartphone			
	Yes	No	Total
Poorest (%)	96.55	3.45	100.00
Poor (%)	97.26	2.74	100.00
Rich (%)	93.65	6.35	100.00
Richest (%)	97.37	2.63	100.00
Total	96.12	3.88	100.00

Pearson chi2(3) = 1.4725 Pr = 0.689

Tablet			
	Yes	No	Total
Poorest (%)	0.00	100.00	100.00
Poor (%)	0.00	100.00	100.00
Rich (%)	0.00	100.00	100.00
Richest (%)	0.00	100.00	100.00
Total	0.00	100.00	100.00

Feature phone / button phone Tablet			
	Yes	No	Total
Poorest (%)	1.72	98.28	100.00
Poor (%)	1.41	98.59	100.00
Rich (%)	3.13	96.88	100.00
Riches (%)	2.63	97.37	100.00
Total	2.16	97.84	100.00

Pearson chi2(3) = 0.5627 Pr = 0.905

Laptop			
	Yes	No	Total
Poorest (%)	1.72	98.28	100.00
Poor (%)	1.39	98.61	100.00
Rich (%)	3.17	96.83	100.00

Richest (%)	13.16	86.84	100.00
Total	3.90	96.10	100.00

Pearson chi2(3) = 10.7328 Pr = 0.013

Desktop computer			
	Yes	No	Total
Poorest (%)	0.00	100.00	100.00
Poor (%)	1.39	98.61	100.00
Rich (%)	0.00	100.00	100.00
Richest (%)	7.89	92.11	100.00
Total	1.73	98.27	100.00

Pearson chi2(3) = 10.6644 Pr = 0.014

Pocket radio / radio			
	Yes	No	Total
Poorest (%)	0.00	100.00	100.00
Poor (%)	0.00	100.00	100.00
Rich (%)	0.00	100.00	100.00
Richest (%)	2.63	97.37	100.00
Total	0.43	99.57	100.00

Pearson chi2(3) = 5.1010 Pr = 0.165

Television			
	Yes	No	Total
Poorest (%)	24.14	75.86	100.00
Poor (%)	22.54	77.46	100.00
Rich (%)	30.16	69.84	100.00
Richest (%)	34.21	65.79	100.00
Total	26.96	73.04	100.00

Pearson chi2(3) = 2.2825 Pr = 0.516

Table A29. Have regular access to the internet for lessons.

	Yes	No	Total
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Poorest (%)	53.19	46.81	100.00
Poor (%)	69.23	30.77	100.00
Rich (%)	71.88	28.13	100.00
Richest (%)	70.51	29.49	100.00
Total	65.41	34.59	100.00

Pearson chi2(3) = 13.4046 Pr = 0.004

Table A30. *Currently attend any coaching centre / private tuition outside of school/ madrasah.*

	Yes	No	Total
Poorest (%)	21.99	78.01	100.00
Poor (%)	40.63	59.38	100.00
Rich (%)	35.94	64.06	100.00
Richest (%)	38.46	61.54	100.00
Total	33.47	66.53	100.00

Pearson chi2(3) = 12.5160 Pr = 0.006

Descriptive statistics by clusters

Table A31. *Ownership of devices by cluster.*

Smartphone			
	Yes	No	Total
Beltola	100.00	0.00	100.00
Bou Bazar	90.63	9.38	100.00
Jamai Bazar	98.65	1.35	100.00
Sonar Bangla	96.43	3.57	100.00
Total	96.10	3.90	100.00

Pearson chi2(3) = 7.9265 Pr = 0.048

Tablet			
	Yes	No	Total

Beltola	0.00	100.00	100.00
Bou Bazar	0.00	100.00	100.00
Jamai Bazar	0.00	100.00	100.00
Sonar Bangla	0.00	100.00	100.00
Total	0.00	100.00	100.00

Feature phone / button phone			
	Yes	No	Total
Beltola	0.00	100.00	100.00
Bou Bazar	3.13	96.88	100.00
Jamai Bazar	4.05	95.95	100.00
Sonar Bangla	0.00	100.00	100.00
Total	2.17	97.83	100.00

Pearson $\chi^2(3) = 3.5467$ Pr = 0.315

Laptop			
	Yes	No	Total
Beltola	8.11	91.89	100.00
Bou Bazar	4.69	95.31	100.00
Jamai Bazar	1.37	98.63	100.00
Sonar Bangla	3.57	96.43	100.00
Total	3.91	96.09	100.00

Pearson $\chi^2(3) = 3.1070$ Pr = 0.375

Desktop computer			
	Yes	No	Total
Beltola	2.70	97.30	100.00
Bou Bazar	1.56	98.44	100.00
Jamai Bazar	0.00	100.00	100.00
Sonar Bangla	3.57	96.43	100.00
Total	1.74	98.26	100.00

Pearson $\chi^2(3) = 2.6049$ Pr = 0.457

Pocket radio / radio			
	Yes	No	Total
Beltola	0.00	100.00	100.00
Bou Bazar	1.56	98.44	100.00
Jamai Bazar	0.00	100.00	100.00
Sonar Bangla	0.00	100.00	100.00
Total	0.43	99.57	100.00

Pearson $\chi^2(3) = 2.6051$ Pr = 0.457

Television			
	Yes	No	Total
Beltola	16.22	83.78	100.00
Bou Bazar	37.50	62.50	100.00
Jamai Bazar	30.14	69.86	100.00
Sonar Bangla	18.18	81.82	100.00
Total	27.07	72.93	100.00

Pearson $\chi^2(3) = 8.2823$ Pr = 0.041

Table A32. Regular access to the internet for lessons.

	Yes	No	Total
Beltola	75.00	25.00	100.00
Bou Bazar	59.21	40.79	100.00
Jamai Bazar	62.26	37.74	100.00
Sonar Bangla	73.20	26.80	100.00
Total	65.34	34.66	100.00

Pearson $\chi^2(3) = 8.6307$ Pr = 0.035

Table A33. Device (television) used for classes.

	Yes	No	Total
Beltola	16.22	83.78	100.00
Bou Bazar	37.50	62.50	100.00

Jamai Bazar	30.14	69.86	100.00
Sonar Bangla	18.18	81.82	100.00
Total	27.07	72.93	100.00

Pearson chi2(3) = 8.2823 Pr = 0.041

Table A34: *Mode of private tuition / coaching.*

	Online	In-person	Total
Beltola	87.18	12.82	100.00
Bou Bazar	53.76	46.24	100.00
Jamai Bazar	61.68	37.38	100.00
Sonar Bangla	78.69	21.31	100.00
Total	66.00	33.67	100.00

Pearson chi2(6) = 20.9580 Pr = 0.002

Figure A1. *Students' access to the internet.*

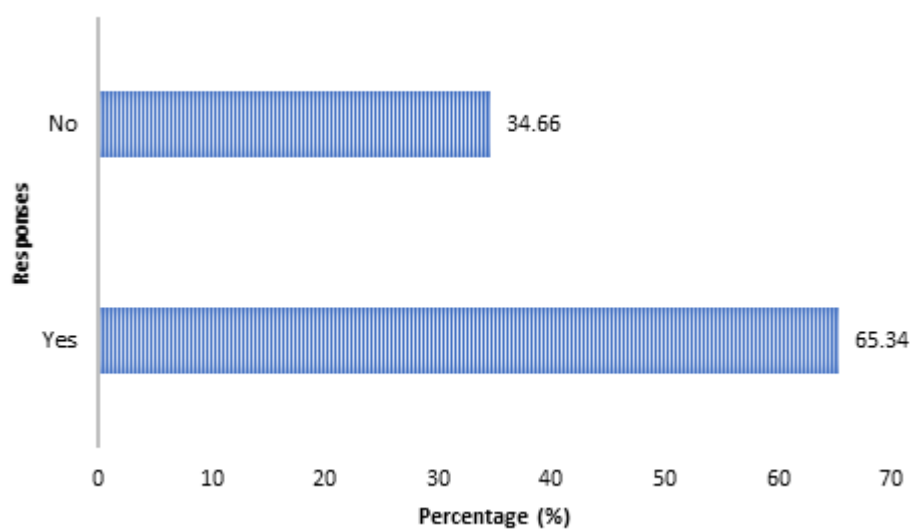


Figure A2. *Students' access to the internet from a gendered perspective.*

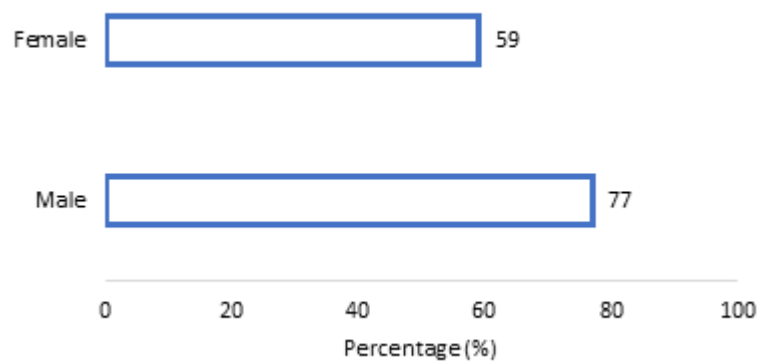


Figure A3. *Source of information about digital modalities.*

