There is No App for That: Manifestations of the Digital Divides During COVID-19 School Closures in India

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The COVID-19 induced lockdowns forced people to shift several activities, including education, online. However, in the context of online schooling, the Digital Divides have magnified and perpetuated existing inequities in the education system and in society. Through a qualitative study with 48 participants across four stakeholder groups we find that students in under-funded government schools in India largely have not been able to access online classes because of a lack of devices, poor quality of Internet access, unreliable data networks and expensive data plans. We also document attempts by teachers and non-profit workers to use mass media broadcast technologies to work around the issue of digital access, highlighting the importance of a human infrastructure to build resilience during a disruptive event. Socioeconomic factors have also forced several students to drop out of schools and into taking up jobs to support their families. We document the importance of enabling environments and economic safety nets at home for online education to succeed. We present some focus points for researchers and policy makers working in the space of digital divide and education to build more resilient systems through Digital Welfarism.

CCS Concepts: • **Human-centered computing → Empirical studies in HCI**; • **Applied computing → E-learning**.

Additional Key Words and Phrases: Digital Divide, Online Education, COVID

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1 INTRODUCTION

Several activities, including education, had shifted to online operations during the ongoing COVID-19 pandemic. Soon after the initial online shift, some commentators proposed that the future of college (and by extension, education) is online [14]. However the existing digital disparities in countries like India have put into sharp contrast how digital access and capabilities can determine if people can perform vital daily functions, including if school students can avail education.

As India went into the first COVID-19 induced lockdown in March, 2020, all educational institutes were closed. Within a week, however, several higher education institutes, and even schools, started online classes using various video conferencing applications like Google Meet, Zoom, Skype and

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Microsoft Teams. However, UNESCO estimates, of the 320 million students in India only 37.6 million across 16 states were continuing education remotely through the online platforms [5, 17]. In this work we find that several factors contribute to this phenomenon. We study the various facets of the Digital Divides, including access, quality of access, affordability and other socio-economic factors, and how it has impacted education and learning for school students in India, during the COVID-19 pandemic. We conduct detailed qualitative interviews with four different stakeholder groups in India: students in under-funded government schools, teachers in government schools, non-profit workers working in the education sector, and, parents of students who go to government schools.

Analysing the interview transcripts, we find that closure of schools and shift to online education has perpetuated the inequities and disparities existing in the education system. We were able to document that online education was a non-starter for several of the students. We are able to document that unavailability of devices, unavailability of reliable data networks, and the high cost of data required to sustain a full day of schooling through video conferencing applications, are big limiting factors. Compounding the problem, several students had to drop out of school and take up employment to support their families which had lost their livelihoods during the lockdown. We also document how the teachers and non-profit workers attempted to use legacy mass media technologies like TV, radio and loud speakers to engage the students, and used instant messaging platforms like WhatsApp to strategise and communicate with the students, with varying degrees of success, highlighting the importance of human intermediaries in digital interventions in the ICTD domain.

The salient contributions of this work are:

(1) **What are the bottlenecks in access to online education? How do the Digital Divides manifest in the space of online schooling?** We highlight facets of the digital divide like access to devices, quality of access, reliable networks and affordable data plans, and socioeconomic factors which perpetuate the existing inequities in the education system.
(2) **What roles do legacy technologies and human layers play in the absence of access to digital resources?** We document methods used by the teachers and non-profit workers to help the students to be in touch with their studies. We also document the use of legacy technologies like loudspeakers, radio and TV broadcasts, by the teachers and non-profit workers in the absence of access to digital resources.
(3) **How should research and policy come together to be better prepared for disruptions?** We discuss the short term and long term ramifications of the disruption to school education and highlight certain pathways for policy makers, researchers and practitioners to build a more resilient education system to withstand future disruptions.

We present some take-away points for policy makers and the SIGCHI research community. As SIGCHI researchers, we should be mindful about the resource demands of the platforms we design, in terms of bandwidth and device requirements, and be mindful of the capabilities, agencies and socioeconomic contexts of the users of the platforms. We augment the findings of other researchers that Digital Divide is not just an access issue, but is compounded by the socioeconomic factors prevailing among the users. Previously researchers have documented the growing disparity in access to digital resources, however gaps still exist between research and policy. Policy makers and practitioners need to put deeper thought into building more resilience into our education systems, in which students would not have to drop out of schools when the families face economic shocks. The COVID-19 pandemic has sharply put into relief the Digital Divides and made access to digital resources and capabilities all the more important. Policy makers also need to consider ways to bridge the Digital Divide by addressing several of the findings in this study and approach Digital Welfarism as a policy. In this paper we chronicle the disparities in the context of school education

in the light of the COVID-19 pandemic. This work therefore might serve as a push for policy shifts in this domain given the large scale and deep impact of the pandemic on education.

In Section 2 we put our work in the context of existing research. In Section 3 we present the methodology for the study. In Section 4 we describe the observations and findings from the study. And, in Section 5 we discuss and reflect on the broad take-aways from the study for researchers and policy makers.

2 RELATED WORK

Our work touches upon several themes of interest to the research community. Through this study we document the different facets through which the Digital Divide perpetuates inequities in society. Specific to the domain of education, being on the wrong side of the digital divide would mean students have had to halt their education during the COVID-19 pandemic, contrary to pitches by technocratic governments that e-learning democratises education. In this section we look at some previous research in this space which will help to contextualise our work within existing research.

2.1 Understanding the Digital Divide

The understanding of the Digital Divide has evolved significantly over the last couple of decades. In Western contexts, Thierer [72] argued that the Digital Divide is 'making a mountain out of the molehill of access', and that market forces would eventually bridge the digital divide. However, over time, it appears that free market forces enable the users who are already ahead to get further ahead at an accelerated space, while those already behind stagnate, and the gap widens further [22, 75, 82]. Authors have argued that the Digital Divide is not a matter of access alone, although access does play a large role in it. Liff and Shepherd [51] talk about a continuum of connectivity, where, the quality of access over mobile Internet or broadband Internet affects the usage. Beyond the access, one's abilities to use, willingness to use and what impact the access has also shape the Digital Divide. Indeed, the content on the Internet is shaped by the expectations and needs of the early adopters, so current non-users might find it less appealing or useful when they eventually have digital access, thus reinforcing exclusion. Along similar lines, Thomas and Parayil [73] use the capabilities approach to say that Digital Divide is not a function of access alone, but a wider developmental problem in which some people have been deprived of the capabilities to use ICTs (Information and Communication Technologies). Sultana et al. [71] look at the problem from a gender lens in the patriarchal society of Bangladesh. Warschauer [80] talks about the many layers in the Digital Divide which can not be solved by an infusion of computers, or other digital devices. Similarly, Journell [47] finds that the digital literacy and cultural barriers perpetuate digital divide causing economic and other hardships for people. DiMaggio and Hargittai [38, 44] talk about expanding the idea of the Digital Divide to Digital Inequalities, where access to digital resources is layered in the equipment, autonomy of use, skills, social support and the purpose of use. Gorsky [43] argues against simplifying digital divide as a function of access as it misses the full picture of inequity and alienation and the larger socioeconomic ramifications.

Arora [22, 23] postulates three kinds of Digital Divides: the Access Divide, the Usage Divide and the Leisure Divide. Governments, researchers and practitioners have been for long focusing on the Access Divide alone, and looking at ways to ensure that more people have physical access to digital platforms [33]. However, access manifests in ways not solvable by ensuring physical reach, rather, social prejudices often define the contours of access. The cyber cafes in India, for example, have long served as the last mile access point. However, socially, cyber cafes are seen as male-only places and often regarded as sleazy and unsuitable for women to visit. Other researchers have documented that beyond physical access, social factors, like one's caste, also determine the usage of Internet kiosks [49]. Similarly women's use of personal phones is frowned upon in many communities.

In recent times organisations have turned their attention towards usage, which has resulted in top-down determination of the needs of the users and an utilitarian view of why and how the poor should use digital platforms. This has given rise to the third divide, which is the leisure divide, because the assumption is that the poor should use digital platforms for meaningful purposes like work, education, livelihood, health, and not for purposes like leisure and entertainment [22]. On similar lines, Toyama [75] postulates that technology only amplifies existing institutional forces, including amplifying any divide that might already be existing in society. So, merely providing access to technology would not automatically lead to bridging of the divide, rather it might amplify the existing divides.

Among other researchers, Vishkaie [79] calls for the world to end disparity in access to the Internet. She cites how countries like Iran or Syria, which are under international sanctions or are at war, are facing the brunt of the pandemic as much as western countries. However, these countries have not been able to evolve their education systems to the point where students and teachers are able to conduct schooling online. Other researchers have developed different strategies to bridge the digital divide through grassroots innovations [34, 54]. Singh [69] argues that the Digital Gender Divide can be addressed by improving education of young girls and by addressing the social and psychological barriers of girls using digital tools.

In this work we do not innovate on ways to overcome the Digital Divide. In this paper we document one of the consequences of not approaching the Digital Divides with a comprehensive and holistic plan. The piecemeal approach to tackling the digital divides has resulted in the perpetuation and widening of the divides. The ramifications become apparent during a disruptive event like the COVID-19 pandemic, when digital literacy and access become key determinants for whether one is able to have a degree of normalcy and continuity in one's life. Our findings can serve as inputs for innovators who design solutions to bridge the Digital Divide.

2.2 Outcomes of Remote Learning

In the context of shift to online education during the pandemic, Azubuike et al. [25] use secondary data from an educational survey in Nigeria and find significant relationship between the socioeconomic status and the ability of students to access online schooling. They found significant differences in access to digital tools between students in government schools and private schools. In addition, they also found significant association between the education levels of parents and their ability to support the students for online education. Xie et al. [83] report that self-motivated learners might succeed in online modes of education, while others suffer from a lack of technical skills and other factors. Sims et al. [67] find that e-learning has the potential to perpetuate cultural and socioeconomic elitism, instead of democratising learning as argued by several commentators [42]. Singh et al. [68] talk about learning space inequalities wherein weak digital infrastructure coupled with familial and social dynamics create a negative learning space at home. In the context of the ongoing pandemic, some researchers have attempted to rethink the design of online learning platform in the emergency schooling context [36, 45, 50]. Several of the earlier findings are echoed in our work. We find that unplanned and sudden shift to online learning does not democratise education. Instead online learning has the potential to further amplify the existing disparities in the education system in our society. We also find that beyond access, the environment at home also determine the quality of learning happening through the remote modalities.

In general, even without the pandemic in picture, several organisations have experimented with e-learning platforms and ideas. Ed-Tech is also currently a rapidly growing market [7]. However, several researchers have found that e-learning or adding technology to the learning process can at best complement regular classroom teaching, not replace it. The *One Laptop Per Child* (OLPC) [10] programme pitched that enabling every child to access a laptop would solve the problem

with school education in the developing world. Similarly, the *Hole in the Wall* [6, 46] programme postulated that when children are left alone with computers, they are able to teach themselves how to use them. Evaluations of these programmes have however not found any significant gains in learning outcomes among the students participating in these programmes [21, 35, 81]. Toyama [76] further warns that technology should not be used as a short-cut towards good education. At best, it can complement the education in schools where the fundamental infrastructure of teachers, classrooms, etc. are already in place. In this paper we echo the findings of other researchers that online classes in themselves do not lead to learning outcomes but require several layers of human infrastructure to be in place together with other enabling factors.

2.3 Studies on Impact of the Pandemic on Education

Since the onset of the school shutdowns several researchers have documented the impact on education owing to the school closures and subsequent shifting to online operations.

Ravi et al. [62] conduct a study with 20 stakeholders to understand the space of school education during the pandemic and recognise the importance of human infrastructures to facilitate digital uptake. We document similar observations in our work. In addition we also focus on the socio-economic factors affecting digital uptake during the pandemic. We also advocate for state support to ensure equitable and universal access to digital platforms and opportunities to develop digital capabilities as the free-market model leads to disparities in both access and capabilities. Cappelle et al. [77] use secondary data from a UNICEF study to report on access to remote learning modalities and perceptions of learning among adolescents during school closures. They find vast disparities in access to remote learning, with a large number of respondents reporting that they did not have access to remote learning. Alvi and Gupta [20] focus on the disruption of the food and nutritional security of children during school closures because of the interruption of the school feeding programme. They note that drop out rates would be significantly large, especially for girls, and may also lead to increase in the rates of child marriages, domestic violence and early pregnancies. Kasturkar and Gawai [48] provide pointers on how to engage children productively during school closures. Morris et al. [55] find that the mental health of college students in the USA have seen a decline during the pandemic when college classes were mostly being conducted online. Our work is a study which provides first person accounts of how the pandemic has disrupted education among students in under-funded schools in India. In addition to documenting the digital divide, we are able to connect several socio-economic factors which play decisive roles on children's learning.

Several news reports have also documented the impact of the school closures and also the divide that it has led to between children who have access to digital resources and have capabilities and an enabling environment to use them, versus, those who do not. BBC News contrasted between cases where students with good connectivity were able to continue schooling, contrasting with students with poor or no connectivity [28]. Similar results were found in a survey by economists Jean Dreze and Reetika Khera [40]. They further note that the lost schooling would be all the more detrimental for children who are just starting to read, write and count. Behar [29] documented the reopening of schools as the pandemic slightly ebbed, and observed the *learning loss* among the students because they missed what should have been taught, and because they might have forgotten what they had learnt before, owing to the extended break from schools. Our work echoes and substantiates the news reports through the first person accounts of the teachers, parents, volunteers and students.

Some commentators and researchers have attempted to understand how the pandemic would change the education landscape. Vegas and Winthrop [78] document that there is a wider acceptance of the care-giving roles undertaken by the schools and the teachers. There is also recognition of the importance of institutional learning, especially for vulnerable children. Other commentators

have said that the pandemic has accelerated the growth of the digitisation of education by 5 to 10 years [12].

2.4 Human Infrastructure in the usage of technology

Researchers have documented the importance of a human layer or a human infrastructure in the access to technology, especially among the new users of the Internet. Marsden et al. [52] call the human layer the Human Access Points (HAPs) and consider the absence of HAPs the reason for the failure of technology projects in developing countries. Sambasivan and Smyth [64] echo similar observations through two field studies with low-income communities in India. They talk about the importance of the human infrastructure for the usage, maintenance and diffusion of technology. Simlarly, Dye et al. [39] document the offline information system prevalent in Cuba, because of the low penetration of the formal online Internet. The users have access to the latest entertainment shows through this offline network supported by human infrastructure for diffusion. In this paper we document the importance of human intermediaries in the delivery of technology-mediated education, especially among the demography in our study. We document that the human layer is very important to build resilience in the delivery of education during disruptive events.

3 METHODOLOGY

We conducted a qualitative study over 7 months with participants from seven states in India: Karnataka, Telangana, Chhattisgarh, West Bengal, Tamil Nadu, Uttar Pradesh and Maharashtra. The first phase of the data collection was spread over 5 months from March to July, 2021. We conducted a second phase of data collection in November and December 2021 to collect additional data as some schools started to reopen in India. The participants in the data collection exercise comprised 20 teachers from 11 schools, 11 education workers from 7 non-profit organisations in the education sector including operators of a community radio channel, 7 parents of school-going children, and a group of 10 students from under-funded, mostly government-run, schools. The focus of this paper is to document the impact of the school closures on the students, who demographically match a majority of school going students in India.

To recruit the participants we used a combination of purposive and snowball sampling, leveraging our contacts in the education and non-profit sectors. The purposive sampling was limited to identifying the categories of the participants, e.g. teachers, parents or students from government schools. The teachers from Karnataka who participated in the study were recruited through the help of the non-profit Children's Lovecastles Trust (CLT), based in Karnataka. Teachers from Chhattisgarh were recruited through a partner social activist. There was one teacher participant from Maharashtra, who was recruited through personal contacts. The participants from the parents category are blue-collar workers in our university campus, recruited with the help of the university administration and the outsourced company who employ the blue-collar workers. The non-profit workers were recruited through a social media platform. The students were recruited with the help of a non-profit, Vidyakansha. The teachers, non-profit workers and parents who participated in our study are associated with students demographically similar to the student group in our study. The participants were recruited independently and separately owing to the nature of the demography and the disruptions caused by the ongoing pandemic. For example, we were not able to recruit students through the parents group as the students had taken up jobs to support their families and to compensate for the loss of livelihood. The pandemic also made it difficult to interview several participant groups in-person. It does not however affect the study as the participants across the categories are linked to under-funded government schools either as students, or parents of students or teachers. In addition, opting for a telephonic interview mode enabled us to reach a diverse group

Table 1. Summary of the different participant groups who participated in the study

Participant Group	Number of Participants	States	Interview Type and Mode
Students	10 (SA1 – SA10)	Telangana	Qualitative, Telephonic
Teachers	20 (T1 – T20)	Karnataka, Chhattisgarh and Maharashtra	Qualitative, Telephonic
Non-Profit workers	11 (NP1 - NP11)	Karnataka, Maharashtra, Telangana, Uttar Pradesh, West Bengal	Qualitative, Telephonic
Parents	7 (P1 – P7)	Telangana	Qualitative, In-person

of participants from different parts of the country. A summary of the different participant groups is in Table 1.

The interviews were semi-structured and were conducted through telephonic mode for the students, the teachers and the non-profit workers; and in-person for the parents. The in-person and telephonic interviews were semi-structured and in the local languages spoken by the participants. All telephonic and in-person interviews were conducted by a male and a female undergraduate engineering student. The questionnaires and talking points for the interviews were designed by the same students. The interviewers speak English, Hindi and Marathi. They took the help of other students for translations for participants from Karnataka and Telangana, where they did not speak the local language. Each questionnaire or talking points was tested with 2 participants from each category for refinement. No monetary or other benefits were provided to the participants to participate in the study. Each interview lasted 20-30 minutes on an average. All participants were briefed about the purpose and anonymous nature of the study before starting the interviews.

3.1 Questionnaires

In this section we describe the talking points for the qualitative interviews with the students, the teachers, the parents and the non-profit workers, including the radio operators.

We developed five different questionnaires for the four participant groups in the study. The questionnaires are semi-structured and are in the form of broad talking points and the interviews were conversational in nature. We describe each of the questionnaires below. The questionnaires are presented in Tables 2 to 6 in Appendix A.

(1) The questionnaire for the students was designed to understand how has COVID changed education for them and how they are coping with it. We also wanted to understand here what were the major problems students faced when it came to access to education. Table 2 summarises the talking points used for these interviews. None of the students in our cohort were participating in online classes, so not all of these questions were answered. Instead, we use the accounts of the other participants to form a picture about the students' perspectives about online classes.
(2) The questionnaire for the teachers was designed to understand how the under-funded schools were coping during the pandemic and what were the measures taken by teachers and the schools to deal with the situation. Since the students in our sample were not attending online classes, the Teachers were also asked to give their perspective on how the students were

coping with online classes. Table 3 summaries the talking points used in the interviews with the teachers.

(3) The questionnaire for the non-profit volunteers was designed to understand the initiatives taken by various non-profit organisations to help students from government schools. We also asked them about and what they identified as major problems for the students as the students in our cohort were not attending online classes. Table 4 summarises the talking points from the interview with the volunteers.
(4) The questionnaire for the parents was designed to understand how COVID has impacted their families' lives and how the school closure has impacted their children's education. Table 5 summarises the discussion points with the parents.
(5) In the second phase of the study we also interviewed operators of a community radio station, and associated teachers, who were broadcasting lessons over a successful radio programme. The discussion points for this group of participants are in Table 6.

All the interviews were conducted in the local language. The questionnaires presented in Tables 2-6 are close translations to English. The interviews were recorded with the consent of the participants. We transcribed the interview recordings for the students, teachers, non-profit workers and parents, and undertook thematic analysis to identify different codes through an iterative refinement, with disagreements being resolved through consensus. We organised the findings under the different codes into different themes as presented in Section 4.

3.2 Ethics

We followed voluntary and self-regulation along standard ethical practices for human-centred research [37], in the absence of a formal IRB-like oversight in our university. All participants were informed about the purpose of the study, the proposed usage of the data contributed by them, and the participants were assured of anonymity, before beginning the interviews. Consent was obtained to record the interviews. All students were interviewed using the phones of their parents, after obtaining explicit verbal consent from the parents. All in-person interviews were conducted with the house-keeping staff in our university campus. The campus is residential and the health of all residents and staff are monitored regularly, thus minimising the risks of infection for the interviewers as well as the participants.

4 OBSERVATIONS AND FINDINGS

In this section we present the findings of our study arranged under different thematic categories which evolved through a iterative thematic analysis of the interview transcripts and survey logs.

4.1 Manifestations of the Access and Affordability Divides

After India went into COVID induced lockdown in March, 2020, educational institutes were immediately closed. As people realised that the lockdown will probably last long, many professions began to shift to operating online. Initially there were no clear guidelines from the government on running online classes. However, several higher education institutes and schools shifted to online teaching. From our interviews with the students, teachers, parents and non-profit workers, we are able to bring out several gaps between public policies and the ground realities in the space of education. We discovered that several teachers and non-profit workers did set up online teaching infrastructure and the teachers picked up online skills, however, online education did not really take off since the beginning and in-effect there has almost been no schooling during this period, for the students demographically similar to our study group.

The most prominent factors which emerged as determinants for whether online schooling was effective was *access to Internet-enabled devices*, like smartphones or laptop computers, *availability and reliability of data networks*, and *affordability of Internet data*, on both the students' and teachers' ends. In the rest of this section we elaborate on our findings under the three themes.

4.1.1 Access to Internet-Enabled Devices. After the schools closed in March 2020, several teachers and non-profits did start online classes, mostly on their own with no support from the government. However, multiple teachers told us that the students' families mostly don't own Internet-enabled devices. In case the family did own a device, it was often reserved for use by the elders of the house and the elders would take it with them to work, leaving the students without a device. A teacher from Karnataka told us that he has a total of 49 students in his class while only 18 to 20 students have access to smartphones. A non-profit worker told us that among his students 15 girls were studying on one phone. Another teacher from Karnataka said, *"Almost all the kids in my school are from slums and they do not have devices or any Internet facilities. (T2)"*[1] In some cases there are multiple school going children in the same house while there is only one device among all of them. This makes it difficult for all of them to attend their classes. The teachers and students reported that often in such cases the elder children were prioritised over the younger children for access to the device for online classes. The parents justified this by stating that if the younger child misses out on a year of education it can be covered with relative ease as opposed to a year lost by the older child. This argument is countered by educationists because children who are just learning to read, write and count need greater hand-holding when compared to older students. Although it did not come out prominently in our data, other researchers have documented that parents are more likely to prefer a boy child to continue his studies over a girl child, if the resources are limited [24].

4.1.2 Unavailability and Unreliability of Mobile Data Networks. In addition to a lack of access to Internet-enabled devices, unavailability and unreliability of phone networks in rural areas is also a major bottleneck in shifting to online education. Attending online classes requires access to streaming bandwidth to participate on video conferencing platforms which are widely being used to run the online classes. India lags behind in availability of high speed Internet, especially in rural India, and was ranked 131 out of 138 in terms of Internet speed worldwide [65]. Our participants complained about the same. One teacher participant told us: *"Students used to travel to dangerous mountainous terrains to access network as there was no network in their village, it was risky and we were scared to let the kids go like this. (T13)"*.

4.1.3 Affordability of Mobile Data. Compounding the problem is that the price of mobile data is not cheap in India when it comes to running high bandwidth applications like video conferencing and streaming, making it unaffordable for many families. A six hour online school day for a single child would conservatively consume 3 GB of data daily, which would translate to roughly ₹700 ($\approx USD9.5$) monthly cost on Jio, India's largest 4G network [13]. This is contrary to the commonly believed anecdote that India has one of the world's cheapest data plans [30]. The price of data has increased in India over the last couple of years and cheap data comes at the cost of both data caps and slow Internet speed. A teacher from Chhattisgarh told us that parents are careful of resources they shared with the children so that they do not consume a lot of data, thus driving up the costs. A participant in the study who is the principal of a school in Maharashtra said, *"Our pre-pandemic school hours were 5 hours, but this turned out to be impossible to carry out online because parents complained that their entire data pack would get over in a single day, and it gets too costly for them to recharge every day. So, as a solution, we decided to cut down the teaching to between 2-3 hours.*

[1] All quotes for students, teachers, non-profit workers and parents have been translated to English from local Indian languages by the interviewers and volunteer translators.

Because of this we could not teach to the detail we preferred and students were left on their own to do a lot more self-study than before. (NP10)"

4.1.4 Attempts to work around using mass media broadcast platforms. Researchers have documented the practice of user driven and context driven technology innovation and appropriation in the Indian context [61]. In our study we found that in the absence of Internet-enabled devices and streaming bandwidth, governments and local administration fell back on other forms of popular mass media platforms like TVs, radios and loudspeakers. The Karnataka government started running classes on TV channels where recorded lectures were broadcast according to a pre-announced timetable. The teachers participating in our study said they pushed the students to watch these TV classes even if they could not attend the online classes. The teachers asked the students to request their neighbours to let them watch the classes on TV in case the students did not have a TV at home. However, group consumption was discouraged owing to the risk of infections. The teachers also followed up about the TV classes with the students by calling them and giving them homework based on the classes.

In another innovation, the teachers from Chhattisgarh who participated in our study began broadcasting the lessons on the village loudspeakers. They developed a schedule to broadcast lessons for different classes on different days. The teachers however admitted that the experiment did not work very well as the students would soon lose their concentration and focus. Instead, the teachers started to call the students to the school in shifts and sat them spaced out for regular lessons. The Chhattisgarh government also put up all study materials for standards 1 to 12 on a website, which was open for students to access. On expected lines, one teacher admitted that very few students would have been able to use this website because they do not have devices or Internet connectivity.

In an example of appropriation of existing technology, WhatsApp was used as a major channel of conversation for teachers to strategise, and also for teachers to communicate with the students or the parents who had smartphones. In the case of students elder siblings played an important role in handholding the younger siblings on how to use WhatsApp. However, the teachers in the under-funded schools had to be mindful of the content they sent over WhatsApp so that it would not consume a lot of data for the parents.

While using mass media tools might have improved the reach of the lessons compared to the reach of live online classes, the learning outcomes seem to have largely fallen short. The physical schooling system provides an enabling environment for the students to focus on their studies and interact with their peers. In many homes, the enabling environment for education is absent. The teachers participating in our study did not observe any improvement in motivation, rather they noticed lack of concentration and interest, especially in the younger students, owing to a lack of regular monitoring and evaluations, which are key aspects in the physical schooling systems. Also, not all students are able to work at the same pace, but the TV lectures did not cater to slow learners. A parent in our cohort told us that his child would often get distracted and lose interest in a video lecture because there was no peer interaction and because the home is not perceived as a place of study. Another parent said that he would see his child walking around when the TV lectures were on.

Through our conversations with the non-profit workers we came to know about a community radio station in Nashik running classes on their radio channel. No online schooling was taking place in the villages in the catchment area of the radio station. *"(one village) from where we started the radio distribution initiative is a very remote area in the Nashik district. Some people there, including kids, did not even have an idea about the ongoing pandemic for a long time. Kids assumed it's a long vacation with no definite return date. Online classes were completely out of the question." (NP11)*

In order to record the classes, teachers would come to the radio station. The lessons would be broadcast according to a fixed timetable, there would also be repeat telecasts for students who might miss a lesson. The station also invited some students to listen to the lecture when it was being recorded. This would provide the students a feeling of being in a classroom, and when the students listening at home heard the interaction of the teacher with the students in the studio, they would also feel engaged as it would break the monotony of one-way lectures. The station operators estimate that about 50-60 thousand students and 150-160 teachers were able to take advantage of the programme. The local teachers would assign weekly tasks to the students, corresponding with the lesson plan on the radio. The teachers would also open the school at times to conduct oral and written tests. A head teacher in a village raised money to distribute FM recorders to the students using which the students could record the lessons for later consumption. The station operators conducted some feedback collection exercises in the field and found that the students loved the flexibility in time because of the repeat broadcasts. Compared to the other innovations leveraging mass media systems like TV and loudspeakers, the intervention by the community radio appears to have had a larger impact. There are four distinctive factors which we observed in the community radio intervention which sets it apart from the other interventions: the presence of students in the recordings engaged the students at home, the FM radio is a relatively easy device to use and is widely available as a feature on even basic mobile phones, the assignment of tasks and conduct of evaluations along with the lessons provided the requisite feedback loop, and, the ability of the radio station to leverage a community of 150-160 teachers as the human infrastructure in their programme. A more detailed field study would be able to further establish the impact of these factors on the outcome of the intervention.

One prominent factor that came out in the conversations is a lack of guidance or policy by the government on the conduct of education during the lockdown, or a timeline for the school reopening. The government did release a guideline on online schooling which recommended limiting screen time and limiting the number of classes per day [18, 70]. However, these guidelines displayed ignorance on the part of the government about a large section of the school-going population not having access to devices or the Internet. The teachers too complained that there was no clear policy by the government on how to ensure continuation of schooling. Seeking help from the government required them to undertake substantial documentation work. Instead, the teachers depended on their own ingenuity and grouped together on WhatsApp to formulate strategies on their own, and also to share resources and homework with the students.

Several researchers and practitioners have reported on the Digital Divides of usage and access previously. The findings in this section augment the existing research reviewed in Section 2. Several researchers have also documented that the Internet access in India is improving, especially after the launch of cheap data plans and the price-wars among the telecom providers. However, as reported by other researchers, the Digital Divides are not about access alone. There is a need to distinguish among different qualities of Internet access based on device ownership, bandwidth, latency and other networking factors, and, price, as reported by Liff and Shepherd [51]: not all qualities of Internet access are suitable for online education. In addition, other socio-economic factors come into play when the enabling environment of a school is no longer in the picture during school closures (Section 4.2). Our work helps to contextualise the work of other researchers during a disruptive event like the COVID-19 pandemic.

4.2 Socioeconomic Factors and their Fallout

While access and affordability of data connections and devices is a major bottleneck in access to online education during the pandemic, through the interviews we are able to uncover several socioeconomic factors which perpetuated the Digital Divides.

4.2.1 Economic Factors. The pandemic-induced lockdown led to several parents in India losing their jobs and livelihood overnight. Reforms over the last several decades in the Indian Right to Education law ensured improvement in school enrolment among children [32]. The pandemic has reversed many of the gains made [53]. For example, the mid-day meal scheme would provide school-goers with one nutritious hot meal a day. This was an incentive for several low-income families to send their children to school. However, with the closure of the schools, and consequent halting of the mid-day meal programme [20], and loss of jobs and livelihood in the families, several students among our participant group had to take up petty jobs to augment their family income. In several cases parents who had lost their livelihood pressured children into taking up jobs. A 15-year-old girl participant studying at a school in Hyderabad has now started working as a porter in her free time to augment her family income. Similarly a 10th standard student at another Hyderabad school has started working at his father's butcher shop, where he feels his time is better utilised. Several migrant workers left for their native places with their families once they lost their livelihood in the cities. The teachers and non-profit workers were not able to get in touch with these families and it is likely that these students would have discontinued their education.

4.2.2 Social Factors. Deaths because of COVID-19 in the families also severely impacted the students' education. A 39 year old parent said, *"My husband died soon after being infected by COVID-19. He was sick for the past 5 years, forcing me to be the sole bread winner for the family and draining all our savings. During a major part of the lockdown I was without employment or income. As soon as the lockdown was eased, I had no choice but to make my two daughters aged 18 and 20, leave their education and work at a factory. I want my daughters to study more, but we are knee-deep in debt and making ends meet has became an uphill task. Forsaking education was our only chance at survival. (P2)"* For many students in India, both parents have died during the pandemic, leaving them orphaned. A teacher from Karnataka told us that three of his students have been orphaned. He said that the students are bright and willing to study but now are left completely alone. Apart from parents, children and teachers too have died. In many places government school teachers were deployed as *COVID warriors* or on election duty, which added to their own personal risks and many of them have died after being infected while undertaking these duties [68].

The participants reported that it was difficult for students whose parents were not digitally literate to cope with the sudden shift to online learning. Online schooling also requires an enabling atmosphere at home, especially for students who are habituated to institutional schooling. Many of the students complained that the atmosphere at home is not at all conducive for studying and that they could not focus on their education [26]. One teacher recalled that they would try to convince parents to not ask the children to do household chores so that they may attend classes. A non-profit worker in our study said *"We tried calling the parents to make them realise that they need to spend some time with the students or that they need to provide the children with phones once they are back from work, but it all fell on deaf ears. Parents did not wish to give their phones to their children for longer hours and often replied that the child will drop a year, and will be back next year. (NP4)"* A non-profit worker told us that their organisations worked with students with learning disabilities. However, it is almost impossible to cater to them through the video conferencing platforms being used for online teaching. Other researchers have also documented learning space inequalities which may result in a negative learning space at home [68].

As a concerning social fallout of students dropping out of school, a non-profit worker participating in the study said, *"The cases of sexual assaults by teenage boys on teenage girls have significantly increased since the lockdown. I feel this is directly associated to the lack of schooling. Previously these boys were involved in school activities and education. Due to closure of schools, they have now slipped into poor company and have taken a wrong turn in their lives. (NP7)"*

4.2.3 Digital Capabilities of the Teachers. When schooling started to move online, the teachers had to make efforts to overcome the digital divides as well. Not all teachers had the capability to shift to online teaching as it was completely new for many of them. The teachers from Karnataka spoke about undergoing coaching sessions arranged by non-profit organisations, to get themselves familiarised with online teaching tools and methods.

Researchers have documented that beyond access, several other factors affect the Digital Divides. For example, certain societies discourage women from using digital platforms [23]. In this section we documented how the pandemic and socio-economic factors have together perpetuated both the digital divide and the divide in the education system. Factors like not having an economic safety net at home or not having an enabling environment at home for education can be deciding factors about both the access and the quality of education during disruptive events like the COVID-19 pandemic.

4.3 Impact on students' learning

4.3.1 Effect on Learning among the students. The participants observed that actual learning has become a casualty during the pandemic. Teacher participants from Karnataka said that students are being automatically promoted to the next class so that they stay enrolled in school, with bare minimum actual learning. A teacher with 16 years of teaching experience expressed her concern: *"Students who were joining the first standard when the pandemic began will soon be transitioning to the third standard. As we have been unable to teach offline, we are not sure as to what extent the students have learnt. So when the students come to the third standard, they might have to be taught basics from the first standard due to the lack of schooling. (T6)"* Apart from this, in situations where some online schooling did happen, the teachers and parents both felt that students get distracted by the digital devices instead of learning. The participants reported that parents of younger children had a hard time getting their children to sit in front of a screen and pay attention to the class. A participant in the study, who is a non-profit worker, said that despite their organisation providing the students with appropriate hardware and network connections for classes, the students did not pay attention in the online classes. She says that there are two reasons for this: firstly, about 15 students have to share one laptop, the visibility and audio is not good enough for each student to be kept engaged, and, secondly, due to the lack of physical presence and supervision, the students do not behave appropriately as compared to how they did before in physical schools. In addition, reduction in school hours to save on data costs, as noted in Section 4.1, has also affected the quality of education as a lot of the curriculum is being left for self-study. We have documented the lack of concentration and focus as being a concerning factor among educationists and parents in Section 4.1.4.

4.3.2 Efforts by Teachers and Non-Profit Workers to Continue the Learning Process. Realising that learning is being affected, some of the teachers and non-profit workers in our study said that when students were not able to attend classes online, the teachers personally visited houses to teach these students. A teacher said *"I went down to almost all of my students' homes when they did not show up for classes for a few days. (T8)"* The teachers also called up the parents to ask them to make the students attend classes, or to check up on why the student wasn't attending. A participant told us that she called up the students who did not have smartphones to guide them on what books to buy and how to study. Teachers in Chhattisgarh started teaching students offline in groups when they realised the online classes weren't helping the students. A teacher started to conduct *Mohalla Classes* (Community Classes) where a few students would gather in an open area and attend classes while maintaining social distance. Similar initiatives were taken by teachers in Karnataka as well. These initiatives however slowed down as the COVID situation kept getting worse. Because several

student families had lost their livelihoods, some teachers in Karnataka provided the students' families with food items and pooled in money to help students with school books.

4.3.3 Gaps in Learning when the schools reopened. Several reports have highlighted the high risks of the prolonged school closures. Mukherjee [56] calls the phenomenon a 'lost generation' and reports on how the school education system has been crippled owing to the pandemic. When some of the states allowed schools to reopen towards the later part of 2021, it became clear that the students are lagging behind. In the round of follow-up interviews in the second phase of the study, a teacher said that they are finding it difficult to teach the current syllabus along with covering the gap for what was missed. Some states made it compulsory to conduct a 'crash course' to cover what was missed. While the senior students are often able to cope with the pace of the crash course, the junior students are finding it difficult to cope.

We also followed up with the teachers involved with the community radio initiative in Nashik (Section 4.1.4). The teachers admitted that during the pandemic the amount of reading and writing was drastically reduced as the radio lessons primarily involved listening. *"Students have lost touch with the writing process during the online schooling. So once they were back to school it was tough for them to come back to their original pace of reading and writing during classes and tests. (T20)"* So, students are finding it difficult to cope when they return to schools. *"It's going to take a long time until the kids get back to pace. And if there is another long lockdown, which seems very likely based on the current situation, this gap will only get wider leading to extreme loss of motivation among kids with no resources and parental guidance. (T20)"* The teachers also observed that the students who were able to cope with ease were the ones who had parental support at home during the lockdown. Some parents ensured that the students focused on their studies, and these students were able to cope better once they returned to school. *"Students with educated parents who were involved in their online schooling and made sure that the kids studied religiously even from home are doing fairly well even after a two year gap. Whereas academically weak students or students with lesser academic support from their household are facing difficulties in coping. (T20)"* However, this number is small, and the students who lack a support system at home are lagging behind.

5 DISCUSSION AND REFLECTIONS

In the preceding section we documented the findings from the interviews we conducted with the different participant cohorts in our study. In this section we distil and discuss some broad take-away for researchers, policy makers and practitioners working in the space of education and the digital divides.

5.1 The Facets of the Digital Divides

Researchers have documented that the Digital Divides are not a function of access alone. There are several social, cultural and economic factors which affect the digital divides (Section 2). Other researchers have also documented that the digital divide is a developmental problem in which populations have been deprived of the capabilities to use ICTs (Information and Communication Technologies) [73]. In this study we are able to unravel several facets of the Digital Divides as manifested during the COVID-19 pandemic. Access to devices, the quality of Internet access and the affordability of data plans, all form barriers for students to be able to seamlessly avail online schooling during the closure of physical schools. Additionally, we document how social economic and cultural factors deprive people from developing the capabilities to use ICTs. Economic hardships because of the pandemic have forced students to join the workforce. Dropping out of schools because of socioeconomic factors will eventually have a cascading effect on the education and development of digital capabilities among these students. In many ways the Digital Divides and

the socioeconomic divide are feeding and perpetuating each other in a cycle. While no country was prepared for the pandemic and ad hoc decisions like holding classes on video conferencing platforms were taken, it is now time to prepare a policy to build resilient education systems. Researchers and practitioners should also be mindful of the resource (bandwidth, devices) demands of the platforms designed by them. They should also be mindful of the capabilities and socioeconomic context of the audience, including students with special needs like learning disabilities. Several of these aspects have been documented by researchers in the past, however there is a gap between research and practice in this domain. Practitioners and industry houses continue to design products ignoring these aspects. The SIGCHI community should work with social scientists and practitioners to develop methods and products to bridge both the digital and the socioeconomic divides.

5.2 The Myth of Improved Connectivity

The number of people connected to the Internet has been rising throughout the world, including in India. There were 749 million Internet users in India in 2020, and the number is likely to grow to 1.5 billion by 2040 [9]. However, the statistics often eclipse certain facts which are key to this analysis. The Telecom Regulatory Authority of India (TRAI) data from 2020 states that of all the Internet users in India, 96.85% are mobile Internet users [15]. Mobile Internet in India is slow and expensive, especially for applications which require a sustained streaming bandwidth, like online classes on video conferencing platforms. The Digital Quality of Life Index has consistently ranked India low in both the speed and affordability of Internet plans [1]. In the face of this it appears that the increased number of users connected to the Internet is at the cost of the access being restrictive on the freedom of usage, which would restrict the users to only use certain categories of apps which are conservative on bandwidth. Measuring how the bandwidth constraints affect the user experience would be an interesting avenue of future work. Policy decisions taken on the assumption that a growing number of Internet users translates to a better quality of Internet access would be counter productive.

5.3 Can technology platforms be a replacement for regular schooling

There has been a growing interest in the advantages of remote learning, especially in Ed-Tech platforms, in recent times. In the Indian context, platforms like Byju's provide content for the school curriculum, Abacus provides mathematics coaching and Whitehat Jr provides programming lessons for young students. There have been calls from certain quarters that Ed-Tech can replace classroom learning, especially in times like the current pandemic [14]. However, different researchers have reported that Ed-Tech can at best be a supplement to classroom teaching, and not a replacement [16]. Our research goes beyond to show that given the existing digital divide in access and use of technology, universal use of Ed-Tech platforms for schooling, replacing classroom teaching, has the potential to leave behind a large number of students in developing countries like India. The students in our study in under-funded schools have had to discontinue their education, at the same time it has been reported that students in well-funded schools and with an economic safety net at home have enrolled on Ed-Tech platforms in addition to continuing to attend regular schools online [3].

Several researchers have argued that using 'frugal' or off-the-shelf and appropriate technologies might be able to make a bigger impact compared to more complex technologies which demand heavy resources [74, 76]. As a validation for this argument, we observed in our study that the government, teachers and non-profit workers fell back on traditional mass media technologies like TV, radio and loudspeakers as online classes failed to take off. Each of these platforms had different reach and different degrees of success. However, the reach of the traditional mass media technologies was greater than the online platforms, especially among the student groups demographically similar to

the students in our study. And with small innovations like having a few students present in-person during the recording in the radio station the teachers were able to capture the attention of students at home as well. However, all forms of technology-mediated education, be it online or through mass media technologies, fell short of the learning experience of physical schools.

It is important that policy makers address the digital divides in the long term. In the short term the policy makers need to augment the existing schooling model through universal and free access to education, along with measures like direct cash transfer to enable participation of students in online classes, and, ensure that students do not have to drop out because of loss of livelihood of their parents.

5.4 The privilege of Digital Access

The COVID-19 pandemic has enabled people with digital access and capabilities to exercise their privilege to work from home and not step out, while several others with livelihood in the non-tech sector have had to step out, risking infections. We find in our study that this privilege, and the lack of it, extends to the school education system as well. The participants in our study describe that students have had to climb mountains to access data connectivity, or have had to sit in groups to consume lessons on TVs and radios, thus risking infections for themselves and their families. Being forced to travel distances to get a data signal or huddle in groups for online classes in themselves defeat the purposes of a lockdown.

5.5 Disruption as a mirror for society

Disruptive events often hold a mirror up to society and test the resilience of the systems and infrastructure in place. For example, events like earthquakes and floods test the relief, rescue and rehabilitation systems [58, 59, 63]. The COVID-19 pandemic has laid bare the shortcomings in the health infrastructure and economic resilience of countries around the world, especially for developing countries like India [41, 57]. While the health and economic fallout of the pandemic has been widely talked about, one silent casualty of the pandemic has been school education. Among primary problems which led to widespread disruptions in education is the lack of safety nets in the Indian economy which could absorb the shock of the pandemic. In this study we document how several gains made in school education over the last several decades in India have been rapidly undone because of the pandemic [32, 53]. Online schooling has been a non-starter for several students because of issues with access, reliability and affordability of the Internet. In addition drop out rates have increased immensely because of socioeconomic factors, and is likely to be higher for girls and younger children [19, 31]. There are increasing concerns that several students who have dropped out might never return to school [11, 17]. Deeper thought needs to be put into this problem by both educationists and designers of technology-enabled education platforms.

5.6 Need for Internet access to be a basic necessity

With more and more services moving online, the access to services for people on the opposite sides of the Digital Divide are in sharp contrast. From railway ticket booking to operating bank accounts, the ease of access and operations is largely dependent on whether one has access to and capabilities to operate digital platforms. Governments in countries like India continue to make technocratic policy decisions and are making access to the Internet essential even for vital functions like getting vaccinated against COVID-19. There is a potential for extreme long term fallout of these policies if universal access to the Internet is not ensured. In this study we document how different socioeconomic factors determine if students have access to the Internet, and consequently, if they have access to schooling during the COVID-19 pandemic. Initiatives like Digital India [4]

and BharatNet Broadband [2] services, which aim to connect all villages in India to high speed broadband, have been around for almost a decade, but they have failed to fill the supply gap. It is time for policy makers to think about Digital Welfarism by making access to the Internet and developing capabilities to use the Internet an essential and universal service.

5.7 Impact of Digital Divide on other aspects during the COVID-19 pandemic

Education is not the only sector adversely affected because of the Digital Divides during the COVID-19 pandemic. The affect on other sectors has also been documented by researchers and news organisations. Several organisations developed contact-tracing apps in the early days of the pandemic, and some countries like Singapore saw initial success in terms of penetration [8]. However, researchers were quick to point out that in data-sparse geographies like India, contact tracing would lead to more problems than solutions. For example, in the absence of legally-backed data protection laws, the contact tracing data is open for misuse, and the low penetration of smart devices and long incubation time of the COVID-19 virus would lead to several false negative cases [27]. The other important fallout of the Digital Divide is in access to vaccines. The Indian government designed an app and web based vaccine booking system, which immediately cut-off a large section of the population who did not have access to these platforms. Later, when walk-ins were allowed, the walk-in vaccination centres witnessed long queues and uncertainties compared to the app-based centres [60, 66]. The third important impact was on access to livelihood. It became clear within a short time that remaining locked-down or in self-isolation is a privilege for the population who are able to earn their livelihood through remote-work over digital tools. However, a large section of the population are dependent on livelihoods which involves interacting with people, including emergency workers, street vendors and other business owners. While we have focussed on education in this paper, the Digital Divides has had far reaching impact on other sectors as well during the COVID-19 pandemic.

5.8 Way Forward

In this paper we have documented through interviews the disruption caused by the COVID-19 pandemic in school education. We have also documented how the government resorted to tech-deterministic solutions like moving schooling online, where besides the lack of access and affordability, other socioeconomic disruptions prevent students from either going online or focusing on their education. In this section we attempt to list out potential avenues for the government, practitioners and SIGCHI researchers to work together in order to soften the blow of disruptive events in the future.

- **Welfarism versus the free-market in access to the Internet**
  Currently the growth of Internet consumers has largely been driven by the free-market in India. The advent of new players and price-wars, along with development of relevant and popular content and applications, has put more people on the digital radar. However, the COVID-19 pandemic has highlighted the deep inequities that exist in digital access and the quality of access. Given the inescapable role that digital access and digital capabilities are likely to play in the post-pandemic world, and given that the free-market has failed to provide equitable digital access and capabilities, it is time to start thinking of Digital Welfarism, where governments strive to provide universal and equitable digital access and enable the development of digital capabilities. This needs to be done with a holistic approach of bridging the digital access and usage divides, instead of the piecemeal interventions which exist today.
- **Building resilient school systems**
  The school closures because of the pandemic has reversed gains made in the last several

decades in the school education system in India. There is a growing concern that the younger students will be severely lagging behind when and if they get back to school, and that several students, especially girls, will never return to school. We have also documented the importance of human infrastructure in access to education, including education over digital platforms. Teachers and non-profit workers innovated in different ways to design curriculum and include students in lessons, tasks and evaluations. Educationists, practitioners and researchers need to work together to build a school system which is resilient to disruptions and which is equitable in terms of infrastructure and access.

- **Inculcating value for education in families**
  The schooling system is a great leveller as it provides the same enabling environment for education to all students in the same school. Our research brought forth the importance of an enabling and supporting environment at home so that students are able to focus on education. The other participants in the study spoke about the lack of supporting environment at homes. It is important for the policy makers and practitioners to inculcate the value of education in the parents and guardians of school-going children. Behaviour shifts in this direction would also shift the parents' attitude towards sharing devices and data connections with the students when required.

6 CONCLUSION

We present a study with 5 stakeholder groups to understand the facets of how the Digital Divides are affecting online schooling during the pandemic. We find that most students in under-funded government schools are not able to participate in online classes because they do not have access to devices or reliable data network, or are not able to afford the data costs required to sustain video conferencing for long hours to participate in online classes. Several socioeconomic factors have forced many students to drop out and take up employment to sustain their families. We also documented that stakeholders like teachers and non-profit workers fell back upon legacy broadcast technologies like TV, radio and loudspeakers to reach the students, however the learning outcome could not match that of in-person schooling. Drawing from these findings, we present several key points which policy makers, researchers and practitioners in the SIGCHI community should focus upon. The policy makers need to focus on building resilient education systems which are able to absorb the economic shocks and digital divides that families might encounter during disruptive events like a pandemic. The path to building resilient school systems might be through Digital Welfarism where the state takes the onus to ensure universal and equitable access to digital resources and capabilities.

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A TABLES OF QUESTIONNAIRES

Table 2. Semi-structured talking points for interviews with the students. Not all questions were answered as none of the participants were participating in online classes

Sl. No.	Talking Point
1	What is your name? How old are you? What grade do you study in?
2	What does a day in your life look like? (ice-breaker)
3	Has the COVID pandemic brought any changes to your daily routine?
4	Do you go to school?
5	After schools closed down because of COVID did your school change?
6	(If school shifted online) Did you continue attending school online?
7	(If school shifted online) Do you attend online classes? If yes, do you have a smartphone, a laptop, or else what did you use to attend classes?
8	(If attending online classes) How was the experience of attending classes online?
9	(If attending online classes) Are you able to understand what is taught in online classes?
10	(If attending online classes) Did you enrol for any other online education platform other than your school?
11	(If attending online classes) Did you seek help from anyone, e.g. a mentor or your elder siblings to continue with online education? (If no supervision) Was the lack of supervision a problem?
12	Are you longing to get back to schools?
13	(If 12 is No) Did you go to school before the schools were closed because of the COVID-19 pandemic? If no, what led you to drop out of school?
14	(If not attending online schools) What do you do currently during the day?
15	(If not attending online schools) Did you like going to school? Do you still wish to go?

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Table 3. Semi-structured talking points for interviews with the Teachers

Sl. No.	Talking Point
1	What is your name and age?
2	How long have you been teaching?
3	Did your school move to online education since the pandemic started?
4	Do you own a smartphone or have you used a computer before?
5	How did you start with remote teaching? What techniques, equipment did you use?
6	How difficult was it for you to adjust to this new way of teaching?
7	(In Cases where the teacher wasn't quite comfortable with the internet or had not used these digital devices before) How did you learn to use computers, the Internet or the online platforms? Were there any coaching sessions arranged?
8	How do you think the shift to online classes impacted the students?
9	As a teacher what are the means you and your school tried so that you could reach the maximum number of students?
10	Have you observed a major drop out of students from your school?
11	For the students who dropped out, have you noticed any patterns around gender?
12	Do you broadly know the reasons that led to these drop outs?
13	For the students who managed to continue: could you tell us if they faced any hardships in participating in online education?
14	Have you been seeing a lack of learning or loss of interest among the students?
15	Did your school or you receive any help from the government or any non-profits to start and continue online classes?

Table 4. Semi-structured talking points for interviews with the Volunteers

Sl. No.	Talking Point
1	What is your name and age?
2	How long have you been working with the non-profit? Did you work with the non-profit even before the pandemic?
3	How did COVID-19 change things for you?
4	Did the schools you work with move to online education ?
5	(If schools have moved online) How did you start with remote teaching? What techniques and equipment did you use?
6	How do you think the closure of schools and shift to online classes has impacted the students?
7	As a volunteer what are the means you and your organisation use so that you could reach the maximum number of students during the school closure?
8	Have you observed a major drop out of students from your class if the classes shifted online?
9	For the students who dropped out, have you noticed any patterns around gender?
10	Were there any measures taken by your organisation to stem the drop outs?
11	Do you broadly know the reasons that led to these drop outs?
12	For the students who managed to continue, could you tell us if they faced any hardships to continue with online education?
13	Have you been seeing a lack of learning or loss of interest among the students?

Table 5. Semi-structured talking points for interviews with the Parents. Not all points were discussed as the children of the parents in our participant group were not attending classes online

Sl. No.	Talking Point
1	When the country went into lockdown because of the COVID-19 pandemic, how did it affect you and your family?
2	What happened to your children's schooling? Did it shift online? Are they able to attend school?
3	(In case of multiple school going children in a family) Are all you children continuing online classes, or have all dropped out, or have some dropped out? If some dropped out and some did not, what were the factors which influenced their decision? How do they feel about their children dropping out of school?
4	(If children had to drop out) What were the ways you tried to stop that from happening?
5	(If children had to drop out) Did you receive any help to avoid this?
6	(If children had to drop out) Do you plan on sending the children back to school after the condition is stable again?
7	(If children did not drop out) How did you manage online education? What problems did you face?
8	(If children did not drop out) Did you own a device with internet connection or did you have to procure it?
8	Did you receive any help or guidance from the school to help support your children?
10	(If children did not drop out) Are your children understanding the lessons taught in online classes?

Table 6. Semi-structured talking points for interviews with administrative members of the radio station and teachers involved in broadcasting lessons over the community radio

Sl. No.	Talking Point
1	How did the initiative start?
2	Why did you choose radio as a medium to broadcast the lessons?
3	Which standard are the radio classes for?
4	Were young students able to grasp and understand audio classes?
5	How did you publicise the programme and how did you manage to make students regularly follow the schedule of the radio lessons?
6	What language did the classes take place in and which all subjects were taught?
7	When were these classes broadcast and at what frequency?
8	Did students attend these classes under any supervision of teachers or elders?
9	How did you record response of the students to the radio classes?
10	Was any evaluation conducted?
11	What was the impact on the students and other stakeholders involved in this?