

“Hartal (Strike) Happens Here Everyday”: Understanding Impact of Disruption on Education in Kashmir

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ABSTRACT

Sustainable Development Goal 4 promotes inclusive and equitable quality education and lifelong learning opportunities for all. However, regions with ongoing socio-political conflict suffer disruption to education and learning. We situate our work in Kashmir, India, affected by socio-political conflict for more than three decades. We did multiple field visits and conducted 21 semi-structured interviews with parents, teachers, students, and members of a non-government organization that runs Community Learning Centers in Kashmir. Our findings present the barriers in education caused by disruption and the role of community learning centers in overcoming the barriers within these contextual constraints. Further, we discuss engaging researchers and policymakers to leverage human infrastructure, embedding uncertainty into the design, infrastructuring trust, and content usability to develop solutions to make education more accessible. Despite significant research in HCI and Education, research in this particular context is under-explored, and our work contributes to filling this gap.

CCS CONCEPTS

- Human-centered computing → Empirical studies in HCI; • Social and professional topics → Cultural characteristics.

KEYWORDS

Disruption, Conflict, Technology, Education, Culture, Trust and Uncertainty, Internet shutdown, Kashmir, India.

ACM Reference Format:

Asra Sakeen Wani, Divyanshu Kumar Singh, and Pushpendra Singh. 2022. “*Hartal (Strike) Happens Here Everyday*”: Understanding Impact of Disruption on Education in Kashmir. In *CHI Conference on Human Factors in Computing Systems (CHI ’22), April 29-May 5, 2022, New Orleans, LA, USA*. ACM, New York, NY, USA, 17 pages. <https://doi.org/10.1145/3491102.3502126>

1 INTRODUCTION

Education is considered fundamental to human development. The United Nations Sustainable Development Goals (SDGs), especially SDG4, reflects a growing focus on prioritizing education that aims to offer universal quality education and lifelong learning for all

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CHI ’22, April 29-May 5, 2022, New Orleans, LA, USA

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ACM ISBN 978-1-4503-9157-3/22/04...\$15.00

<https://doi.org/10.1145/3491102.3502126>

[26]. The goal emphasizes the need to deliver education as a basic fundamental right that must ensure inclusive quality education and learning opportunities for all. However, the regions facing ongoing or protracted socio-political conflicts face disruptions to day-to-day activities [61]. Thus, attributed to the underlying tensions due to such prevailing circumstances, education in these regions is not regarded as an immediate concern and is often overlooked [71]. The conflict disrupts the formal and informal educational processes and jeopardizes the development of a robust, stable civic society and the education of aspiring children. Moreover, the regions with ongoing socio-political disruptions face a myriad of unique challenges with an increased number of school dropout rates, poor literacy levels, safety concerns for accessing education, infrastructural issues, among many [98]. All these issues put children from such areas at a higher risk of being illiterate [98].

The Jammu & Kashmir region in India, particularly Kashmir, continues to face ongoing socio-political disruption and insurgency [4] for almost three decades. The political unrest experienced by the population has flared significant disruptions to almost all the spheres of their lives[39, 73]. Moreover, due to the decades of conflict, education in Kashmir has remained in a consistent state of dismay. As one of the crisis’s most glaring casualties, the education sector has observed a severely direct impact on children’s education since 1990 [59]. Schools and colleges have remained closed for months during the periodic and extended periods of unrest, which has compromised the quality of education. It is faced with a loss of more than 60% of the total working days in the academic calendar. In 2019, after the revocation of Article 370¹ on August 5, 2019, at least 1.5 million Kashmiri students remained out of school for 202 days [10]. It is further compounded by the indefinite internet and communication blackouts². Thus, exposing the weaknesses in the educational ecosystem, which has failed to absorb the adversarial shocks, especially for internet use. Furthermore, the COVID-19 pandemic has worsened the scenario.

Research in Human-computer interaction (HCI) and Computer-supported collaborative work (CSCW) has explored the use of technology for education in both resourced as well under-resourced contexts. For example, designing language learning applications [46], MOOCs [65], social-robots [9, 53], virtual reality-based learning experience [102], etc to assist students as well as teachers [99]. There also exists prior work in HCI and CSCW in the field of crisis informatics that studies disruptions primarily focusing on natural calamities and disasters [84, 88]. Besides this, an existing thread of studies in crisis informatics has explored the relationship between technology and socio-political disruptions. For example,

¹https://en.wikipedia.org/wiki/Article_370_of_the_Constitution_of_India

²<https://internetshutdowns.in/static-page/jammu-kashmir/>

designing and understanding the use of technologies for healthcare experience [92], use of technology in daily life [16, 80] or refugee technology [35]. There exists a prior scholarship that studies the effect of disruption and crisis, such as COVID-19, on education in HCI and CSCW [74]. However, the challenges and experiences in conflict-affected contexts such as Kashmir are materially different and do not generalize uniformly with what is already cited in the HCI and CSCW for other geographical and cultural contexts.

In this paper, we situate our qualitative study in the context of Kashmir. For this work, we sought to understand the following research questions – **RQ.1) How do students, parents, and informal educational spaces support and continue education during disruption?** **RQ.2) What are the different technologies used to impart education, and how are they used during ongoing disruption?** To this effect, we conducted multiple field visits and conducted 21 semi-structured interviews with parents, teachers, students, and members of a non-government organization (NGO) that runs Community Learning Centers (CLCs) in Kashmir. The CLCs spread across multiple districts in Kashmir aim to continue providing learning at the primary level during disruptions in Kashmir. These learning centers prepare students to reintegrate into formal learning environments, including academic sessions, remedial sessions, and recreational activities. We explore diverse perspectives to understand all stakeholders' contextual, cultural, and technological challenges regarding continuing education with CLCs. We highlight three significant findings from our work, i.e., a) impact of disruption in daily life and education, b) role of CLCs in continuing education, and c) use, perceptions, and challenges with technology.

Our research makes multiple contributions. Firstly, we provide contextual and cultural insights into educational and technological infrastructure in Kashmir, India, extending the HCI scholarship. These empirical findings would lay the groundwork for the designers and researchers to design interventions with conflict-affected communities in the future. Secondly, we argue for embedding '*uncertainty*' into the design of socio-technical systems to overcome technological failures within such contexts. Here, we provide implications for researchers, designers, practitioners, and policymakers to leverage human-techno infrastructure. Thirdly, we emphasize on *infrastructuring trust* within the communities concerning the technological usage around the three focal areas of concern – health, gendered tech use, and life threatening security risks. Fourth, we highlight the need for generating educational content with local resources to embrace the relationship and relatedness with content. Finally, we argue for researchers to engage with conflict-affected communities across the globe to understand unique and critical design challenges which are often shadowed with the mainstream progression of educational technology.

The remainder of our paper is structured as follows. We first outline the background and related work in section 2. Next, section 3 provides methodology with details of the study and procedure. The next following section 4 describes the findings from the study. We then provide discussion in section 5. Lastly, in section 6 we outline the limitations and future work of our study and finally conclude the paper in section 7.

2 BACKGROUND & RELATED WORK

Jammu & Kashmir³ in Northern India is located primarily on the Himalayan Mountains. While Kashmir valley has remained disputed between India and Pakistan since the partition of 1947 of India, since 1990, the valley has increasingly witnessed armed conflicts, thus disrupting normal life. Any violent event, e.g., Pulwama attack⁴, is followed by indefinite curfew and internet shutdown. In August 2019, through an unilateral decision the Indian government abrogated the Article 370⁵ of the constitution. With this, the erstwhile state of J&K was split into two union territories. This was followed by an approximate year-long lockdown across the whole state with the world's most prolonged internet blockade [49]. During this time, at least 1.5 million Kashmiri students remained out of school for 202 days. Overall, the education sector has witnessed a direct impact on children's education since 1990 [59].

Below we place our research in the context of previous HCI research on the design & deployment of educational technology within diverse contexts. Following that, we offer an overview of the role & applications of technology during various crises and disruptions and the research gaps that this study aims to address.

2.1 Education and Technology

The domain of education has been a primary focus of research across all the research communities. A large body of existing scholarship in HCI, CSCW, and ICTD has focused on technology-mediated education in under-resourced contexts [1, 43, 50, 58, 79, 97, 105]. With the progression of technology, researchers across the global north and global south have studied the design of educational technology for diverse communities [83]. These studies cover a large spectrum from designing language learning applications [46], MOOCs [65], social-robots [9, 53], virtual reality-based learning experiences [102], education applications for children in under-resource settings [50, 83] with the goal to improving the learning outcomes. The studies have covered a plethora of design techniques to explore education and technology, for example, participatory design [19, 106], cooperative inquiry [25], asset-based design [14, 62], etc. Moreover, the prior research has explored technology design to support students' education within the classroom [1, 97] and out-of-school learning environments [58, 69]. Uchidiuno et al., [97] designed a table-based application for the school students in Tanzania and observed an increased engagement among the student in the classrooms with limited resources. In the out-of-school setups, Kam et al., [43–45] and Kumar et al., [50] designed and deployed mobile-based English language learning traditional games for the students living in the slums in rural India, which were more engaging and intuitive. These studies aimed at providing access to educational resources on low-cost devices to rural children in out-of-school settings, at locations and times that were more convenient than school.

Moreover, researchers have focused on leveraging the existing technological assets within the communities to improve the learning outputs. Cho et al. [14], in their work leveraged the existing assets within the low-income Latinx communities by designing

³[https://en.wikipedia.org/wiki/Jammu_and_Kashmir_\(state\)](https://en.wikipedia.org/wiki/Jammu_and_Kashmir_(state))

⁴https://en.wikipedia.org/wiki/2019_Pulwama_attack

⁵https://en.wikipedia.org/wiki/Article_370_of_the_Constitution_of_India

low-cost SMS services for families to connect students with out-of-school learning opportunities. Madiao et al., [57] deployed a voice-based IVR learning system in the constrained settings in Côte d'Ivoire that aimed to foster children's literacy developments and investigated adult support as a critical anchor to improve learning among children. Similarly, to improve the learnings among the low literacy populations and resource-constrained environments, another line of research investigated the impact of learning by disseminating video-mediated education resources [2, 24, 79]. Vishwanath et al., [102] in their work detailed the role of low-cost virtual reality learning experience among the students at an under-resourced learning center. Researchers have also explored the factors such as socio-cultural values, environment, etc., which affect the design of collaborative educational applications for children [83]. The existing work within education and HCI has covered multiple dimensions and environments, although studies focused on using technology for education within conflict-affected communities need further exploration.

A common thread in most of these works is the internet requirement and, at times, smartphones. However, in our context, the internet shutdown removes the omnipresence notion of the internet and thus requires applications that remain functional without a network for a longer duration.

2.2 Disruption and Technology

Different populations and communities across the globe continue to face disruption to various events such as natural calamities, public health crises, war & violence, etc. The prevalence of various technologies such as ICTs, social media, etc., has also found its usage during such disruptions [89]. Prior scholarship in HCI, CSCW, ICTD has explored the role and application of technology during crises, and disruptions [60, 61, 80, 84, 88, 89], also termed as crisis informatics. Research in crisis informatics has provided heterogeneous account of technology use and implications during various crisis events, such as, floods [84], earthquakes [88], riots, criminal and political violence [18, 64, 68], war [61], etc.

Prior literature has shown the different use of technologies during disasters and natural calamities. Shaw et al., [84] in their investigation of Twitter use during the Queensland flood, highlighted the use of social media as both communication and an emergency management tool. They found that social media provided a space for emotional exchanges and distress communication. Similarly, Vieweg et al., [101] studied the use of micro-blogging web posts during the Oklahoma Grassfires of April 2009 and the Red River Floods. They highlighted the need to better design the information extraction systems to enhance situation awareness with a broadcast message for a broader population and individuals. Researchers have also explored the technology used during the public health crisis as well [32]. Gui et al. [32] conducted a qualitative analysis of social media posts related to Zika virus spread to understand the use of such communication by public health bodies and citizens. They unfurled the discussion on technology use in decision-making during such a crisis, as users often struggled to find credible information.

Researchers have also explored the technology used during the conflict, war, and riots [18, 61, 64]. Mark et al., [61] conducted an ethnographic interview study in the context of Iraq that has been

facing a protracted conflict to understand the resilient practices adopted by the citizens using technology to carry out their day-to-day activities. Their work highlighted the limitations posed by the environment and how the citizens reappropriated tech, devised patterns, and adopted practices that enabled them to adapt to the environment and even be productive. De Choudhury et al., [17] studied the affective dimensions of Twitter data during the Mexican drug war violence. Their findings highlighted the gradual effective change in the tweets during the protracted war and its impact on people's psychological well-being, and they argue for better designing tools to cater to the mental health needs of such communities.

However, the experiences and the challenges cited in the existing scholarship are materially diverse depending on the nature of the conflict and do not generalize uniformly across geographies. Moreover, conflict-affected contexts such as Kashmir (see section 2) still are understudied within HCI research. There are only limited studies to explore the impact of conflict/disruptions on the education and technology use [28] in such conflict-affected contexts. It is established that every crisis has a different dimension of information needs and mechanism to share information [37, 84]. Hence, it is crucial to understand the mechanism to deliver education and the role of technology and its use in a context like Kashmir.

3 METHODOLOGY

3.1 NGO: The Partner Organisation

We collaborated with CHINAR International⁶⁷ to gain access to participants located in Jammu & Kashmir, India. The NGO works with vulnerable children and marginalized youth in Kashmir through their quality education and socio-economic initiatives. They have been actively working for more than ten years with under-resourced communities in Kashmir, primarily in rural settings. Through their initiatives on imparting quality education, they work with 25 government schools across various districts in collaboration with DSE⁸ (Directorate of School Education). After the abrogation of section 370 in August 2019, they established Community Learning Centers (CLCs) to continue supporting the education of students during the shutdown. The organization administers 11 CLCs across seven districts —(Srinagar, Shopian, Pulwama, Budgam, Baramulla, Bandipora, and Kishtwar) of Kashmir. These centers aim to prepare students to reintegrate into formal learning environments, including academic sessions, remedial sessions, and recreational activities.

3.2 Participants and Recruitment

We recruited our participants with the help of the NGO following purposive and snowball sampling [15] approaches. Before going into the field, we conducted multiple interactions online, and the first author conducted in-person organization visits to establish a relationship and deepen the understanding of work. Through our partner organization, we identified three community learning centers (CLC) — Srinagar, Handwara, and Kulgam, to visit and recruit participants for the interviews. We made multiple visits to the centers to recruit participants for the study. Table 1 represents the

⁶<https://www.chinarinternational.org/>

⁷We would interchangeably refer CHINAR International as organisation and NGO

⁸<http://www.dsek.nic.in/Hill/index.html>



Figure 1: Setup of Community Learning Center

demographics of the organization members, parents, and teachers. Table 2 represents the demographic data of students.

3.3 Data Collection

All the interviews except with organization members were conducted face-to-face (see figure 2) starting early in December of 2020 at the premises of the CLCs (see figure 1). Interviews with the organization members were conducted telephonically. The interview protocol was categorized around five sets of themes – a) background and getting to know, b) the value of the CLC program, c) goals and aspirations, d) impact of disruption on the educational activities, e) usage and perception of technology for educational purposes. All the participants were first informed about the purpose of the study, were duly assured of anonymity, and written informed consent and demographics data were collected from them. For minor students (between the ages of 10-18), consent from the guardian was taken before the interview. Participation was entirely voluntary, and no compensation was given. Each interview lasted for a minimum of 15 minutes to a maximum of 90 minutes, with an average of 45 minutes. The first author conducted all the interviews in Kashmiri, Urdu, and English. The interviews were audio-recorded with prior permission using the first author's mobile device. The first author collected all the data in the form of audio notes, field notes, photographs, and video recordings with prior permission from the participants. Audio recordings were translated — and transcribed to English as necessary — for analysis.

3.4 Ethics

Prior to the study, protocols and materials were shared with the Institution Review Board (IRB), and the study was conducted with approval from the IRB committee. Special attention and care were taken while recruiting students; the first author spent some time with them at their learning center by engaging in learning and classroom activities to familiarize herself with students and vice-versa. Students were asked to address the first author as 'Didi', which is a common Kashmiri word to refer to elder sister. After



Figure 2: An interview being conducted at one of the site

receiving permission from the parent and teachers and taking assent from the student, the interviews with students were conducted. For the rest of the participants, before each interview, they were briefed about the study, the type of data being collected, and how it will be used in the future. Followed by that, verbal as well as written consent was received. Also, the organization's name in the paper has been used with their due permission.

3.5 Positionality and Reflexivity

All the authors of this work are of Indian origin and have prior experience working with diverse communities in India. All the authors have conducted studies in HCI to understand digital technology in education and healthcare. Asra was born and brought up in Kashmir, can read, write and speak fluent Kashmiri and Urdu, and conducted the interviews and field-visits in Kashmir. Our analysis of the data collected is likely to be biased by our strong desire to improve access to education within the state of Jammu & Kashmir. We ask that our paper be read as such.

3.6 Data Analysis

We transcribed and analyzed 32 hours of interview recordings. Initially, the first author translated and transcribed all the interviews in English. We conducted an iterative and inductive analysis of transcripts using open coding and thematic analysis [11]. The entire research team was collectively involved in this process. To start, the first and the second author individually read and engaged in open-coding all the transcripts line-by-line and noted down their own different codes in their code list. We then clustered the codes into the first-level of codes such as — "using YouTube for doubts in mathematics", "organization helping with daily needs during disruption", etc based on the emerging patterns in data. Then they met each other to discuss and generate a code list. After this, they again engaged in the second iteration of open coding using the initial set of the code list. After each iteration, they met the third author to discuss the coding process and transcripts, refine codes and conceptualize themes to a higher level, such as — "leveraging

ID	Age	Gender	Employment Status	Education	Location
Organisation					
O1	29	Male	Employed	Master's	Srinagar
O2	35	Female	Employed	Master's	Srinagar
Teacher					
T1	25	Male	Employed	Graduate	Handwara
T2	39	Male	Employed	Graduate	Kulgam
T3	27	Female	Employed	Graduate	Kulgam
T4	24	Female	Employed	Graduate	Srinagar
Parent					
P1	32	Female	Homemaker	Primary	Handwara
P2	56	Male	Daily Wager	Primary	Handwara
P3	35	Male	Daily Wager	Primary	Kulgam
P4	46	Female	Homemaker	Primary	Srinagar

Table 1: Demographics of Organization, Teachers and Parents for the interview. (Abbreviation are as follow – O#: Organization Members, T#: Teacher and P#: Parent. Here '#' signifies number.)

ID	Age	Gender	Class	Type of School	Location
S1	11	Male	4th	Private	Srinagar
S2	10	Female	5th	Govt.	Srinagar
S3	11	Male	5th	Govt.	Srinagar
S4	11	Female	6th	Govt.	Srinagar
S5	14	Male	7th	Govt.	Srinagar
S6	11	Male	4th	Govt.	Handwara
S7	10	Male	5th	Govt.	Handwara
S8	11	Male	5th	Govt.	Handwara
S9	12	Female	6th	Govt.	Handwara
S10	11	Female	6th	Govt.	Handwara
S11	11	Female	5th	Govt.	Handwara

Table 2: Demographics of Students for the interview. (Abbreviation are as follow – S#: Student. Here '#' signifies number.)

community assets" and "*mistrust and fear with tech*", etc. This process was followed until saturation was reached, and all the authors agreed upon all themes. During this process, the research team used tools like Miro-board⁹, Google sheets to brainstorm and construct the themes.

4 FINDINGS

Through the analysis, we structured the narrative of our findings around particular themes and their sub-themes. The central themes of our findings are categorized as:

- *Disengagement, Loss, Fear: Consequences of Disruption.*
- *Community Learning Centers as Repair Infrastructure.*
- *Use, Perception, and (In)Accessibility: Technological Infrastructure.*

4.1 Disengagement, Loss, Fear: Consequences of Disruption

4.1.1 "Firstly, we are left with no money": Worsening Socio-Economic Condition. The people living in the state witness extreme socio-economic and identity-based hardships. All the stakeholders whom

we interviewed have faced or were currently facing these hardships. As one of the parents (P2, Male, Kulgam) who was a daily wage worker and the sole earning member in the family told us –

"Extreme hardships occur because of those strikes. Our family conditions get deteriorated – it hugely impacts our economic conditions. An individual goes out for work and earns little money for a day which, even otherwise in regular times, gets possible only after 10 or 15 days. Now, with those strikes, everything comes to a halt. There is no positive progress."

Living with extreme socio-economic hardships directly affects the education of the children. During such situations arranging meals/groceries for survival takes priority, and education takes a back seat. We found that many families took help from NGOs working in Kashmir or the local community ties for basic necessities. As (P1, Female, Kulgam) told us –

"And, the biggest thing is we are left with no money – then his (teacher's) elder brother (neighbor who works in NGO) at least tried to arrange grocery supplies for us like tea, oil, chili, pulses, etc. However, there is no arrangement for education."

⁹<https://miro.com/>

Consequently, this often limits the individual agency of the family members; the elders force the younger members of the family to abandon education and engage in some form of economic activity available to support their families. The NGO members also mentioned that parents are often forced to take their children to work sites and engage them in labor work as an extra hand to earn extra money. An organization member (O1, Male, Srinagar) mentioned to us —

"In the areas where we work, the children from those areas are made for sharing family responsibilities — they are made to work at their family orchards, resulting in a significant skip in their attendance. So, if we talk about Kulgam, the laborer here charges 700-800 rupees for a day — and parents here involve their children in work to earn this amount of money..."

We also found that not only the younger generations but youths and adults are also affected and have been forced to suppress their aspirations. As a teacher (T3, Female, Handwara) told us —

"Yes! It (disruptions) affects a lot. We always have to think about the halaat (conditions) first, and then think about the work (employment). Like my cousin brother who wanted to become a driver, like driving sumo (a popular taxi vehicle), his father told him not to become a driver because 'hartal' happens here everyday and transportation is the first to shutdown. This would lead to a lot of loss (economical), and his father later advised him to switch to something else or prepare for competitive exams to get a job but don't get into transportation."

The growing socio-economic problem adversely impacts not only students' education but also has a long-term impact on shaping their aspirations as they are routinely exposed to the economic conditions of their families.

4.1.2 "Some 'groups' may not like it?": Embedded Fear, Trauma, and Mental Health. The politicized nature of education in Kashmir leaves parents in a critical dilemma where they are engulfed with acute fear and uncertainty from multiple dimensions. The multiplicity of fear and uncertainty among parents ranges from following the government to not offending any of the mainstream or extremist political ideologies and terrorist groups operational in the state.

On the one hand, state-imposed (mainstream government actors) curfews, communication, and internet blockage restrict educational activities [107]. On the other hand, threats from the local extremist and terrorist groups also do not let educational activities occur. The threat and fear generated by these groups are consequential [23]. Therefore, attempts to continue education and other similar initiatives often go in vain because of the embedded fear that sits among the people, where sending out their children for such activity is treated as placing the students' lives in jeopardy. As explained by one of the teachers (T2, Female, Kulgam) —

"Parents do not support that (educational initiatives) because they fear sending their children out from home to anyone's place. Because you don't know, maybe some groups may not like it, and then they think that child's life would be at risk"

It is not only the adults who foresee more profound complications and concerns to safety; such fear is also embedded into young children's minds. One of the students (S4, Male, city) explained to us —

"We are not allowed to go outside; a lot of fear and danger is associated with that. See if an encounter happens, then the whole area is at risk and danger, and our lives are also under threat and danger."

Such embedded fear has resulted in alarming but hidden social, emotional, and mental well-being issues in people residing in those areas. The prior literature has also documented high rates of stress disorders, trauma, and depression among the communities living in conflict-affected zones [33]. Similarly, the conflict in its totality has negatively impacted people's lives on the whole, from economic to health. One of the teachers (T2, Female, Kulgam) detailed how the disruptions and disengagement from routines have affected the mental well-being of the whole population of the valley.

"Here all the residents are from the daily working class, and it gets challenging. It gets difficult to reach work because the transport facilities are unavailable. Outside movements are restricted, and that in turn makes the overall families suffer. Also, I think it has always had a negative impact. See how much it has impacted our mental health. The whole population lives in trauma and fear."

Hence, an average individual's life is caught up in the dilemma of whether to send or not to send students for educational activities and it is the student facing the consequence of loss of education.

4.1.3 Embezzled Academic Infrastructure. For delivering quality education, infrastructure is an important and developing goal across various schooling systems in India. However, the unique nature (socio-geo-political) of these disruptions in Kashmir brings up new challenges in addition to the challenges faced across the educational ecosystem in India. Disruption in the educational activities is usually followed by ad-hoc decisions in examination and evaluation patterns. The curtailment of syllabus to compensate for lost time and lenient evaluation schemes have been among the most common methods. At times, students have been promoted to higher classes for a couple of consecutive years or even declared graduates without appearing for exams or any form of assessment. However, repeated use of such ad-hoc approaches leaves parents and teachers in deep worry related to the future of the students.

One of the teachers (T1, Male, Kulgam) explained to us —

"Their daily life routines are distorted with almost no idea of future goals."

In addition to these anomalies, as a cascading effect of postponement or cancellation of exams, the graduate dates for students have also been postponed. One of the teachers (T4, Female, Srinagar) recalled her experience —

"Being a student myself, my degree has been delayed by a year. Just because of this conflict my degree won't get completed until 2022 which was supposed to get finished by August 2021." (sic)

While, there are Kashmiri students who travel to other states within and also outside India to complete their education but they

also face social and economical challenges. A larger discriminating social construct and image around the Kashmiri identity brings the challenge of discrimination, as is witnessed by various students across India [40, 67, 81]. These discriminatory and hateful acts have prevented individuals from access to education outside the state, as organization member (O1, Female, Srinagar) described to us –

[...] you see if students go for studies outside it has its impact on them there as well – because you know going outside with a "Kashmiri" tag is always a problem. Wholly and solely all of us are affected, and in that me and my generation is included too..."

Additionally, going outside (to other states) for the studies is not viable for many students because of economical reasons.

4.2 Community Learning Centers as Repair Infrastructure

4.2.1 "Now, I think I will become something": Continuing Education in Crisis. The Community Learning Centers (CLC) were started after the abrogation of the Article 370 in 2019 which led to severe disruption of regular life and loss of regular education hours with a complete Internet shutdown that lasted almost a year. The organization reached out to community heads, teachers, and parents to build a safe space within the communities to continue the learning so that the students do not have to travel outside the locality for education during the crisis. As is shared by the organization members (O1, Female, Srinagar) –

"That time we thought to start something that is within the community where students do not have to travel too far for studies, so we were like let us do something, let us find something in the vicinity, those teachers or their elders who can at least help students in that community to continue their studies to bridge the discontinuity that is brought to their studies because of the situation." (sic)

With the introduction of these centers, the organization is trying to overcome challenges posed by the disruption in the Kashmir valley. They successfully established an "alternative" education model where the access to education continues even during disruptions and blackouts. Their model has introduced a more personal child-teacher relationship that is often missing across govt schools [54] and it has also imparted relief and faith amongst the parents. As a mother (P1, Female, Kulgam) told us –

"Our children's education were affected due to strikes when they were not associated with this program (CLCs), as they were completely cut off from the studies during that time"

Both the parents whom we interviewed mentioned "positive changes" and "more disciplined" as some of the most visible outcomes of sending their children to one of these centers. The teachers also pointed out key differences in terms of the students' developed learning and intellectual abilities as witnessed across the period of 4-5 months. Increased involvement of parents such as attending parent-teacher meetings, even in remote/village areas such as Kulgam, Zampathri, etc., was often described as a "big thing" by

the teachers. According to the teachers, the most significant accomplishment was building a strong foundation that the students did not have before. For example, teacher (T1, Male, Kulgam) told us –

"The situation is such that a student from class 6th could not perform a single-digit addition. However, now Masha Allah, if I give them a four-digit sum, they can do it. Be it multiplication, subtraction, addition, or division; now they are good at it. Before it, they did not know how to do any."

Also, we found out that there have been multiple instances where teachers of CLCs found engaging themselves in multiple roles – as mentors, peers, and even care workers (e.g., to assist special education needs of some students). In couple of cases, special education needs for some students were overlooked by their parents. Instead of supporting, the parents threatened and engaged in physical violence that discouraged learning pace of specially abled students. The teachers of CLC were able to identify the special needs and counsel the parents. Such examples of readiness to actively engage and assist the community have developed a strong support system for the community. The CLC model has instilled hope and faith in the minds of students and parents for nourishing aspirations. As one of the students (S6, Male, Handwara) told us –

"I like coming here to this center and by attending this place for learning, I am sure I will become something one day"

4.2.2 Technology as Tool for Learning. Even though there have been multiple occasions of internet shutdowns and communication blackouts in Kashmir, technology, like in any other conflict-affected context [61], has found some applications, especially for education. Youtube, WhatsApp, Telegram, and Facebook are the most commonly used applications for education and related communication. After COVID-19 lockdown, as things were moved to online space, it created a huge barrier for NGO to reach remote communities. They used available technologies like Zoom, WhatsApp, etc. to reach students who possessed smart devices and also created a telephony conference bridge for students with basic feature phones. For students who did not have any technical device available at their place, the organization tried to give them devices. Most of the teachers used their personal devices in the classroom.

As described by (O1, Female, Srinagar) –

"...now for those who have it... see we perform registrations of the students, we gather the data and collect their phone numbers and check who has internet access, who has a normal basic phone. You know when we were running RLC (Remote Learning Center) there were students who had basic phones and few had phones with access to the internet. the ones with basic button phones we used to conduct conference bridge calls for them so that teachers stay connected with them for teaching..." (sic)

Technologies such as WhatsApp are commonly used for communication between parents and teachers. Organization members mentioned receiving "at least 100-200 messages a day in groups" from parents and students for various inquiries. The NGO also created a WhatsApp groups for all the teachers associated with

their program. Initially, these groups were created for attendance checks for teachers, but soon teachers started sharing pictures and videos of various activities that they used to teach students. These instances helped the organization to enable more teachers to engage in creative activities and share them with other fellow teachers. Moreover, this exchange also led to teachers introducing technological tools such as laptops and platforms such as YouTube to teach students. Organization member (O2, Male, Srinagar) mentioned to us —

"He teaches them using a laptop, and seriously when he shares that with us — actually, we have a WhatsApp group with them and when he shares that in that group, other teachers get motivated by that. And if you will see that group, these teachers share stuff that is best in their individual capacities — because they get inspired and try to become more and more creative."

4.3 Use, Perception, and (In)Accessibility: Technological Infrastructure

4.3.1 *"My niece has big mobile, so my son used to go to her place and study": Sharing Devices within Families and Community.* While the NGO provided technological devices to some students, it is not feasible to provide the same to everyone due to financial and funding constraints. Hence they only provide these devices to the children whose families do not have any access to smartphones or similar devices. It was observed that the children in the family share devices with their siblings and parents, and sometimes, it results in some of the children missing classes. As explained to us by one of the students (S5, Male, Srinagar) —

"I use my father's phone, my elder brother uses my mother's phone, and he uses it for a longer time. My father goes to the office, and that is with me for a lesser time."

There is also an aspiration to use these devices even if one has never interacted with one. Mainly among the children of the families, even if they do not have access, they develop such aspirations by watching other children and elders use these devices in the neighborhood. To accomplish the requirement to access these devices whenever required for educational purposes such as exams, the children and elders in the family leverage their family and community ties and reach out to their distant relatives and neighbors to seek access to these devices for education. As one of the parents explained to us (P2, Male, Kulgam) —

"Yes, the school authorities send the work on mobile phones and also teach them on those big mobile phones. However, we do not have big mobile phones, and the one I own does not support all of that. So my cousin's brother's daughter owns a big phone, and my elder son visits her and uses that for his learning. They study from mobile phones..."

4.3.2 *"Phone is like a Sword": Mistrust & Fear, Health Concerns, (Un)Intended Harms.* Using technology in this context is deeply integrated with the socio-cultural values of the families and individuals. The parents and elders in the families have strong concerns and fear about their children's use of mobile phones (especially the

internet). Their main concerns are associated with the (un)intended harms of technology being a tool that could potentially introduce children to the unsafe (insurgency) side of the technology use [28]. As explained to us by one of the parents (P2, Male, Kulgam) —

"I think in my opinion face-to-face learning is better than mobile learning because with face-to-face learning children stick to only one place. With mobile-based learning, they get distracted in many directions, and there is no trust in these kids. They can use it for 'other' purposes. At least for face-to-face, there is proof that the child is at school."

Gender and technology use have a different interplay at home, where mostly daughters are not allowed to use technology. Even if they are allowed, they have to use the device under someone's vigilance or surveillance; for example, mothers often overlook their daughter's phone use. Most elders and parents fear misuse by their daughters and cast doubts over technology's ability to deliver recommendations, advertisements, or pop-ups that are believed to be *"inappropriate"* for girls and women to watch. One of the parents (P1, Female, Kulgam) compared the phone to a *"sword"* and explained to us the socio-cultural implication of girls using such devices —

"This phone is like a sword in your hands. If you can use it properly, then that's okay; otherwise, it ruins your family, your relatives, your community, and yourself as well and you won't be able to make any progress in life... open YouTube and make a search you'll see there are such things which are not appropriate for a girl to watch. On Facebook also there are such things that pop up surprisingly, which a girl should not watch... This is the reason why I do not allow my eldest daughter to use phone without my vigil because there are things on YouTube and Facebook that a girl should not be watching."

Another concern in the mind of parents and mainly in the community's mind is the health issue with phone use. Primarily, the elder and parents fear the growing concern of harm to the eye while using technological devices for longer duration. However, if a single incident of such harm in children is reported within the community. All the elders and parents echo it at their respective homes. As one of the teachers (T3, Female, Handwara) narrated an incident for us —

"They should not use it (mobile) more because these children are very young and it impacts their eyes. In our community, there is one girl. His father said she used to use the phone a lot, and then she had to go through an eye operation at Chandigarh one month ago. His father mentioned that she used to use the phone a lot, which impacted her eyes. From that day, all the community members here are scared and say that children should not be exposed to using phones."

4.3.3 *"Internet is like Oxygen": Problem with Uncertain Internet Shutdowns.* Using technology for education is often termed as a *"necessary"* and *"useful"* tool for teachers, students, and organization members. The NGO did not have plans to use technology or the

internet at their respective centers in the initial phase because of the uncertainty associated with the internet connectivity in the particular context. However, later, teachers on their own started using it to impart education to students. But the prevailing circumstance due to the context's conflict-torn nature makes it challenging to use the technology at its best capacities. One of the prominent reasons is the uncertainty surrounding the internet. The state regulators turn down all the communication channels, especially the internet, in case of any adverse situation or even to prevent any such situations. This usually catch them off guard and ultimately hinder their day-to-day activities ("no phone, no WhatsApp, no zoom, no nothing!"). Time and again, people have found these shutdowns as "biggest hurdle," and this problem is deeply ingrained in their life, that they have concluded, i.e., "*this is going to exist forever*". As one of the organization members who compared the internet with "oxygen" (O1, Female, Srinagar) explained to us —

"The internet or other things are very important and without that it has a lot of impact on everyone. In fact leave everything all of our work suffers. If the internet at our office stops working for an hour then we face a lot of challenges because almost all of our work depends on the internet. Even for the smallest thing, say, for example, email cannot be used then. So obviously, if there are any ups and downs with the internet, it impacts us a lot. I think the internet is like oxygen for us now." (sic)

Moreover, usually after a shutdown, the gradual restoration of the internet follows a stringent protocol as witnessed by the interviewee, only landline (telephone) connections are restored first, followed by 2G internet and slowly-moving towards 3G and henceforth over the period of months at least. The extended nature of restoration results in poor connectivity and ultimately pushing students backward in their learning pace, as explained by one of the students (S3, Male, Srinagar) —

"In online classes, we are not able to understand anything. Also, the internet speed is very slow, so that adds to the process of not understanding anything. We informed the school authorities as well; they tried to make us understand. However, the next time they said that it was because of the connectivity issues, and we cannot keep repeating the same time and again. Network issues like no voice made us learn nothing. Also, learning maths is difficult because the quality of the camera was terrible."

The suppression of aspiration (see section 5.1.1) is also influenced by access to the internet. As the internet plays a significant role in learning and accessing educational material, its shutdown often leaves students no further access to such services. Neither the students could communicate with their peers to arrange for these services if unavailable in their local community. If this inaccessibility continues for a prolonged period, the students are forced to reconsider their goals and aspirations of the future. As one of the teachers (T1, Male, Handwara) explained his ordeals with lack of internet access —

"When the situation got a little normal, I started with my preparation again; I did not purchase books again and consulted Google and YouTube. I got 68 points, and

the 76 was the cut-off for qualifying... If everything had been normal, meaning the internet would have been available, I would have studied more, and I believe I would have qualified for the test..."

4.3.4 Missing "Context" Specific Content and Information Overload. Another barrier to the use of technology stems from the "English" nature of the current platforms such as YouTube, Google, etc. The children do not have a good grasp of English and face extreme difficulty in finding, learning, and understanding educational material available to them on the internet. As one of the students shared with us —

"Right now, I cannot even read Urdu that well — also I am unable to find Urdu and Kashmiri material on YouTube for help."

In general, the educational content as per syllabus and books in Kashmir remains absent from various platforms. While students and teachers can find 'something' from some platforms such as YouTube, surprisingly, platforms such as DIKSHA, which the Government of India has introduced, has no content for Jammu & Kashmir in Urdu but only in English. Their design and structure makes it even more difficult for users to access such application, as explained to us by one of the organizations (O2, Male, Srinagar) members —

"I was last time logging onto DIKSHA. It's an application, and it took more than half an hour to get registered on that application, and then when I checked, there was no content available for J&K. Also, it was so difficult to log in to that application in the first place only to realize that there was no content available for J&K. That interface is so difficult to navigate through, that is just not at all intuitive." (sic)

Due to this, they students often end up scrolling and searching through multiple search windows. Teachers and organization members remain concerned about the younger students referring to unrelated content for their education. Hence these tasks are left for the teachers and the organization. They compile a list of resources and share it with students. Organization member (O2, Male, Srinagar) explained to us —

"I have to first open 10 applications myself and review them first. Alternatively, I have to take help from YouTube, and there are like 50 videos, and then I have to choose which video I should share with the CLC teachers so that they can get a cue from that..."

5 DISCUSSION

5.1 Design within Uncertainty

One of the core insights that we draw from our findings is the prevalence of '*uncertainty*' in both the infrastructures – socio-political (for example, sudden physical disruptions such as curfews) and technological (for example, indefinite internet shutdowns) in the Kashmir region. These uncertainties are deeply embedded into the infrastructure, along with the fear and helplessness in the minds of people in Kashmir. Conflict-affected regions would often have multiple underlying uncertainties, ranging from arranging basic needs to disconnected technological tools. Hence, this situation is unique, as the basic assumption of many system designs such as

access to fast internet or even low-bandwidth internet is challenged every day. With these complexities and our findings, we expand our understanding of the underlying challenges with design, which is to design *within* uncertainties. It implies that researchers, policymakers, designers, engineers should either incorporate/embed uncertainties into their design or acknowledge the uncertainties beyond their design. To elaborate further, we need to either design our system/artifacts to make them operational even within uncertainties (such as internet shutdowns) or develop sensitivity and acknowledge our privileges and assumptions in our design while designing. This reflexivity would create constructive debates to better design frameworks, methodologies, and artifacts in such a situation as it would open avenues for other fields and researchers to contribute. Using either of the options may help in avoiding techno-centrism and the juxtaposition of technology within such contexts. The relationship between uncertainties and HCI is not new; prior research in HCI has addressed uncertainty. Such as – understanding uncertainty in presenting or communicating data to users in information visualization, personal informatics, end-user machine learning tools, etc. [30, 31], implication on uncertainty with using crowdsourcing systems [56], measuring uncertainty in game design [70], etc. Gries et al., [30] highlighted the need to communicate better the uncertainties of data-driven decisions to the users. Soden et al., [86, 87] suggested two modes in which HCI can treat uncertainties – a) *Generative*, i.e., it is inevitable and can be used in the design of artifacts/systems like risk communication, suspense in game design, etc. b) *Structural*, i.e., it is produced by contemporary relationships between ideology, power, and practice, as a site for questioning how the political/cultural context shapes uncertainties.

The two modes mentioned above, even though not inclusive of various uncertainties that anyone may encounter in HCI [87], embraces uncertainty and approaches it as a site of inquiry. Taking the concept of uncertainty being '*generative*' further, we are not only arguing for embracing [87] the uncertainty to better design systems but also to embed and contextualize it as a platform to design in conflict. Taking insights and learnings from Sultana et al., [91], they proposed design *within* patriarchal communities, rather than imposing our norms and tactics upon the users, as they mentioned – "*we have to work within the situation as it is*". Drawing upon all these prior relationships between uncertainty and HCI, we propose an alternative dimension to look at this relationship, i.e., Design *within* uncertainty. We also want to emphasize the need to critically examine the design of socio-technical infrastructure, to understand the agency and ubiquity of the internet as the basis of design especially, in educational technology design. Design *within* uncertainty could help us overcome some of these challenges as it may push technological infrastructure from a necessity to an aid or a tool. However, the larger question remains how do we '*Design within uncertainty*' to deliver agency back to users and operationalize tech as an aid. To this, we provide two possible design orientations that may help us design interventions to make technology more useful for our participants – a) Human-Techno Infrastructure as '*Disconnected Mode*' and b) Operationalizing Libraries and Caching.

5.1.1 Human-Techno Infrastructure as '*Disconnected Mode*'

One of the prominent findings from our study is the strong community ties

with extended families and neighbors, which are often translated into making things work during disruptions – sharing devices with neighbors, sending children in the neighborhood to study, arranging basic necessities with the help of teachers, etc. It reflects the significance of the human infrastructure, which takes foreground and technology is pushed into the background during disruptions. Hence, one of the critical resources which could be leveraged in the design is the existing human infrastructure, which has been proposed by Sambasivan and Smyth [77] as "*a human infrastructure lens to draw attention to the sociotechnical ties and linkages that constitute this infrastructure*". It was further extended by Dye et al., [21] in their work on understanding human infrastructure to access the internet in Cuba, where they highlighted the need for "*emphasizing the community-building and long-term information infrastructure-building efforts*" to sustain the internet, which was not accessible otherwise.

We recommend that when the standalone systems fail to work within the existing infrastructure due to such uncertain events, designers should integrate '*disconnected mode*' as a 'default' option into their socio-technical systems. For example, when students did not have access to either devices or the internet, the organization delivered hard copies of the educational content to continue education. Similarly, leveraging and operationalizing human intermediaries along with technical systems in the design [76, 77] would be helpful to make a sustainable educational delivery ecosystem work during the disruptions. Dye et al., [21] established 'participatory internet', as an alternative to ensure access to 'Cuba's Offline Internet' in the community. Similarly, HCI researchers, along with community members, NGOs, policymakers, and government, should investigate and enable an ecology of '*disconnected mode*' to continue operations offline without the internet. This is of utmost importance as what is supposed to be the most ubiquitous technology (for example, the internet), would be the first to be brought down during socio-political adversaries¹⁰ [55]. Another potential solution is to leverage 'old' technology such as community radios and television to broadcast educational content, which has previously been implemented in various other places [6, 95], and within India as well [63, 82]. Though it is important to note that such broadcast content should not be regional but rather *local*, implying we should integrate local teachers into this network, as was done at the CLCs by the NGO to engage students better. This would provide students with options to engage with teachers of their choice, who could better foster their learning and help build their aspirations. Communities with no access to any technological device could be equipped with community learning centers that should have access to such devices. However, we understand the limitations and obstructions of power structure *within* and *outside* in implementing such design interventions, hence it is crucial to work out discussions & negotiations with various stakeholders for the same.

5.1.2 Operationalizing Libraries and Caching. Libraries are a storehouse of information, and while we move towards more tech-oriented libraries [3] also called e-libraries, there are still a large number of public libraries across the world. Similarly, in Kashmir, as per the official government numbers, there are a total of 72 public

¹⁰Even at the time we are writing this paper, there is an internet blackout imposed in Kashmir

libraries in various districts [41] such as Srinagar, Bandipora, Kargil, etc. However, these libraries have not been adequately equipped with staff and resources to manage. For example, in Kupwara's district library, there was "only a single official placed to manage 32,000 books" [38]. Avid readers and people who want to get information are often dissatisfied with such services. These libraries have significant potential, especially for students to continue their education even during disruptions, as they are located in community neighborhoods. We recommend that policymakers should – a) invest in library management and b) develop micro libraries in communities and villages. Along with policymakers, researchers from HCI, Library & Information Science, and CSCW should engage in investigating and re-designing both – a) tools to manage public library infrastructure better and b) low-cost e-library resources which could be available at home. Taking insights from the recommendation on Design *within* Uncertainty (see 5.1.1) mentioned above, it is crucial to design offline e-libraries resources. For example, Encyclopedias which act as a dictionary for factual information could be one of the ways we can think of designing such offline libraries for educational content. Moreover, leveraging the human-techno infrastructure to share information, as was examined by Dye et al., [21, 22] could be an asset to enhance the capabilities of such encyclopedias (offline libraries). Similarly, two concepts – a) 'cache' which is defined as "*component that stores data so that future requests for that data can be served faster*" [103] and b)'lite mode' in applications, which require less data to function. Both of these could be leveraged in low-bandwidth scenarios. One of the findings highlighted the slow and gradual restoration of the internet in Kashmir after disruptions. Hence, designers and researchers could leverage these concepts to design more efficient and equitable socio-technical solutions. For example, it is often difficult for individuals to move outside of their homes during disruption. Hence, people only travel out for limited needs and reasons. Designing an IVR-based information system to access public library catalogs could be one way to minimize the burden on users of traveling to multiple libraries in search of books, etc. Hence, the HCI, CSCW, and Library Science researcher should take into consideration such contexts to better design information systems that could assist in meeting educational requirements within uncertainty and conflict.

Design intervention like disconnected mode, offline library encyclopedia, caching, and lite mode would help reassign the agency of control (of aspiration, of liberties, information, etc) back into the hands of the user from the technology as well as the state. As was experienced by one of the participating teachers who could not access information (books) due to internet shutdown and was left short of a couple of points in examination to achieve his aspirations. One of the limitations to these recommendations is that education is a constant quest for knowledge, and to bind it all together into one's ecosystem such as one proposed is practically challenging. As Freire highlights in his theory of problem-posing, that education is an act of freedom (acquiring knowledge) and hence is not static [27]. Therefore, there is need for HCI researchers and designers to constantly engage in such educational technology design challenges.

5.2 Infrastructuring Trust

Our findings draw on the experiences of our participants' socio-political and socio-culturally shaped perception of using technology, with 'trust in tech' being one of the major elements with its usage. Our data present a three-layered relationship between trust and perception of using mobile tech devices within the communities – scientific or health issues, socio-politically shaped safety issues, and socio-culturally shaped community expectations.

Firstly, from our findings, the participants presented their view on the scientific or health issues with the tech devices, which stems from the concerns amongst them where the technology is believed to impact the children's eyes and overall health conditions. While there is existing literature in line with our finding that attests to technology imposing health concerns with its excessive use and increased screen time among students [20]. Our findings present one unique perspective based on the scientific concerns with the technology where one case in a community led the user going through an eye procedure. This created an atmosphere of fear and instilled a lack of trust amongst parents with the use of technology for children. While there exist solutions to mitigate these issues by incorporating blue-light filters, screen times, etc. The reception of such solutions still has not been established, primarily due to a lack of trust in technology. Hence, HCI researchers and designers need to understand such issues and devise methods to communicate such solutions within the communities. One potential solution is involving the parents and trusted intermediaries (e.g., teachers/community leaders, etc.) in the design loop to maximize the usability and acceptance of the solutions. Another solution could be to tackle this issue by involving health experts in the solution loop where they can counsel and offer a word of advice to parents and students. Workshop-based methods within communities, as also noted by Kumar et al., [51], could be helpful to mitigate the problem of embedded lack of trust in the usage of technology based on health concerns.

Secondly, given the sensitive (prone to violence) nature of the context, the parents expressed strong concerns with the technology usage among children, which were majorly influenced by the fear of mistakenly visiting or clicking websites or pop-ups related to insurgency or terrorism. According to parents, this fear and mistrust are invoked mainly with social media such as YouTube, Facebook, Twitter, etc. Prior literature has witnessed security and trust issues with the tech such as Talhouk et al., [16] where they highlight that – "*focus of the much technical security design is to distinguish between authorised and unauthorised*". They argue for understanding the security design agenda that is "*needed to better cater to the needs of a diverse group of individuals whose threat horizon, as exemplified, is both heightened and amplified through this piece of mobile technology*". However, in our context, which has been affected by conflict, insurgency, and terrorism for more than three decades, the threat horizon is not only heightened and amplified but also is deeper and severely consequential. Both the state and insurgent/militant groups threaten a local citizen's freedom and life. For example, insurgents/militants groups have conducted deadly and ghastly attacks in Kashmir, which has costed many lives [8, 72]. On the other hand, the state, with its stringent laws which makes "bail an

exception, and jail a norm" such as Unlawful Activities (Prevention) Amendment Act (UAPA), 2019 [66, 108] have been used by the state to detain critics/journalists/students. Amidst all of this a local citizen is the one who has suffered the consequences and is living a life full of fear and mistrust. Social media such as Twitter are used for provoking and influencing youth to join militant ranks in Kashmir, as Gabel et al., [28] highlighted with use of Twitter there are "*motivations of the new generation of militancy emerging in Kashmir after 1990*". Consequently, participants, especially the parents, develop mistrust and fear towards mobile technology.

Hence, HCI researchers need to engage with such a population to understand their concerns and design better security design frameworks and solutions. Talhouk et al., [16] proposed that "*freedoms that the mobile phone engenders are dynamic and require a continuous repositioning and re-balancing of prevalent security frameworks and agendas*". We recommend HCI research in our context could leverage participatory design (PD) methods, as it could provide a tool to engage the community members and appropriately design systems to gain their trust in the system. For example, PD sessions with parents and teachers to understand how they envision a safe and secure technology for their children. However, PD has its own limitation, as highlighted by Hussain et al., [35], "*(PD) do allow such methods to come closer to the community, in most practical contexts, the design is still dominated by the expert designer's belief and expertise*". To which they propose, to move towards the idea of *infrastructuring* i.e., we need to move the focus from design to community, which leverages local resources and local knowledge, reducing the chance of value intrusion.

We propose that HCI research should move towards '*infrastructuring trust*' i.e., to not only take security design to the community but also to integrate transparency and literacy of security vulnerabilities leveraging local resources and knowledge. For example, local teachers could help researchers in communicating and educating parents about features such as parental controls¹¹, Kids-zone (e.g YouTube Kids¹²), etc along with potential loop-holes or vulnerabilities and their mitigation strategies. Kumar et al., [52], suggested developing privacy and security literacy in educational applications by leveraging 'teachable moments'. For example, to integrate transparency and literacy researchers could offer probes in technology to parents/students/teachers' about what would happen if they click on this pop-up or advertisement. Moreover, there is a need to develop privacy and security literacy based educational curriculum for students. As Hume's skepticism offers that the messy realities of the real world could not be measured and shaped by science and technology [34]. Hence, it is crucial for researchers, designers, and practitioners to design secure & safe systems/tools and establish & communicate transparency, vulnerabilities, and awareness regarding the same. It becomes more critical and urgent in conflict-affected contexts such as ours, where the repercussions endanger human lives.

Lastly, the mobile devices used by our participants (children) were shared within their families, as is also investigated in literature as a common practice among low-income countries [12, 47, 75, 90].

The device access and usage from our findings for the female participants are also socio-culturally shaped where the usage patterns and access to different applications are surveilled by parents. This monitoring of the technology-based usage patterns among females stems from multiple inherent contextually and culturally shaped norms. For example, technology access is gendered within communities rooting from the historically prevalent discrimination towards females, socio-cultural expectations [104], value system, and religious beliefs within communities [36, 91]. Similarly, we infer that this might also be one of the influencing factors of the embedded conservatism within the society, which has widened the gap of technology usage for females. Therefore, these monitoring mechanisms tend to control the agency of the young females by surveilling their exposure to consumption of the supposedly prohibited content and online presence on social media platforms. Parents highlighted stronger concerns with reputation and harms to families and community with technology use by girl children (see section 4.3.2).

Ibtisam et al., [36] in her work with Muslim majority communities in Pakistan, highlights that the socio-cultural and religious beliefs in communities are deeply rooted and hold operational values among the communities. These values and beliefs impact the everyday activities of the communities and advocate designing technical solutions which are value sensitive that accommodate values and beliefs into the systems. Similarly, Sultana et al., [91] in her ethnographic work with Bangladeshi Muslim women, advocated for designing *within* the context and limitations of the context for the solutions to be acceptable and usable within such communities. They argue to uphold the agency of the users rather than imposing our (researchers/designers) norms and values. While we agree with up-holding a similar approach in our context as well, at the same time, we want the researcher to focus on the more profound implications of such an approach. As there is an urgent need to reconsider our design orientation in contexts where female learners face bias and discrimination towards access and usage of mobile devices by families or communities. We believe that in our context, it is important to reflect onto Bardzell's quality of 'Advocacy' in Feminist HCI [7], while taking into account Sultana's idea of designing '*within*' [91]. In a context such as ours, HCI research could work with a balancing advocacy with nuances of society and context. Design and researchers should look beyond the assumptions and beliefs of democratic outcomes and dialogue, while working with parents and community members. As, embracing the idea of working entirely *within* the context and upholding the preconceived notions about "misuse" of tech by females might hinder the reception of workable solutions. For example, if we can design a workable solution amidst disruptions in our context, but as cultural & religious beliefs hold strong values, the parents may not let their female child use the same. Hence, it would unfurl further significant gender-tech divide, leading to loss of education specifically amongst female learners. As Covid-19, with the global emergence of technology based-education, has also brought a much deeper gender-tech divide, especially with regards to female education [78].

Hence as put forward by Bardzell [7], the designer must be aware of '*Ecology*' in which they are designing, how it (tech) is going to be affected and how it (tech) is going to affect the stakeholders.

¹¹https://en.wikipedia.org/wiki/Parental_controls

¹²<https://www.youtubekids.com/>

Multiple potential solutions can be developed to overcome the concerns posed by the parents in our context, such as designing an application that does not allow children to access other applications which parents believe the child may misuse, etc. However, the reception of such applications should not be enforced; rather, it should be infrastructured within communities by leveraging intermediaries [92, 104], such as teachers and organizations working on the ground. For example, applications along with parental control and Kids-zone could incorporate tags which describe type of content (example, images, audio, etc), e.g., basketball, scooter, vegetables, etc. Such applications should also incorporate a feedback loop from teachers and parents, so that any content or example which is not appropriate could be changed. All such design strategies should be communicated (not enforced) to parents by teachers or other intermediaries. Karusala et al., [48] suggested using Whatsapp to communicate gender equity values using careful multimedia selection. Future HCI research could leverage such a solution in our context as well, teachers can communicate to parents and promote the use of features such as content-tagging, app-locks, etc instead of snatching access to education applications. Moreover, teachers have a strong personal connection, relationship, and relatability with parents. Therefore, they could better engage in putting forward the case for allowing their children to use such applications, even if that requires their vigilance because the educational solutions should not fall prey to the cultural & religious biases and end up excluding the female learners (or any group) from the educational landscape.

If the design of the system falls prey to such socio-cultural challenges, researchers and designers should altogether reconsider even to design a solution for the same, as it can further deepen the ordeal upon the disadvantaged users [7, 91]. Furthermore, researchers and designers need to consider a middle route to workaround context-aware, culturally acceptable, and inclusive solutions within the communities.

5.3 Education Content Usability

Our findings demonstrate major barriers to accessing good quality education content. The students reported language, i.e., English, as a barrier, and the teachers reported a lack of means/medium to access the relevant material conveniently. Despite the growth of technology in the education sector and a plethora of education material available, our findings show that the eventual usability is still a challenge (see section 4.3). 'English-as-a-barrier' with technology use has previously been highlighted in the HCI, CSCW, and Social Science research [48, 65, 96]. Prior research has highlighted the importance of designing and delivering the content in local languages [42, 93]. Karusala et al., [48] proposed the need to design "*online content repositories with a more sympathetic view of those not fluent in English*". In our context, we recommend that the HCI researcher and designer could leverage the existing human infrastructure, such as local teachers. For example, CLCs recruited local teachers from the community, and they helped bridge the gap as they could access the available content (in English) and yet explain in the local language. Familiarity with language (not only limited to spoken) is one of the foundational requirements to establish a '*dialogue*' between a student-teacher and teacher-student

[29]. As Paul Freire [27] argued, engaging in '*dialogue*' among a teacher-student and vice-versa establishes a critical learning environment. Relationships and relatability with the students' context have a significant impact on students' learning environment [29]. More than filling the language gap, the local teachers would also help bring the '*trust*' as we learned that there is a general deficit of trust between authorities and the local population because of prevailing conditions (see section 4.1). The local teachers, who are already trusted within the community, play an essential role in *infrastructuring trust*. The students and parents find it easy to form a bond with them. Moreover, engagement of local teachers also accounts for cultural sensitivity, e.g., parents reporting concerns on material suitable for girls or not (see section 4.3.2), as they come from the same culture and may help assuage the unfounded fears of parents. Therefore, we believe that engaging local people as part of a solution could be very effective in a context like Kashmir. The HCI interventions need to involve the local people. Engagement of local teachers will also provide resilience against the internet shutdown and keep a channel of education open.

The second major barrier reported was difficulty in finding usable educational content [74]. The teachers reported spending hours on public platforms like YouTube to find helpful content. The YouTube platform was also popular with students and NGO members. YouTube provides all its content for free. However, given the amount of content available there, it is overwhelming to find usable content (see section 4.2.2). There have been attempts to provide solutions for curating the content of YouTube, e.g., VideoKen. Using the VideoKen software, one can create an index of the YouTube Video, thus finding the content within a video directly without watching the entire video. However, it currently works only for Videos in English and is also a paid service. Prior work in HCI by Anderson et al., [2], explored the potential of Digital Study Hall (DSH) – video-supported learning in resource-constrained schools in India. Drawing inspiration from such existing work, we recommend that HCI research could involve the experienced teachers at CLCs to generate the locally relevant video-supported educational repository, and then the same could be disseminated across various other CLCs. The other good repository of Educational Content is Khan Academy which is completely free and provides curated content. However, in a hyper-local context, the curation needs to be as per the local school/board requirements. Different commercial ventures have also become prominent recently and claim to deliver curated educational content for multiple state boards in India [13, 94, 100]. Though being run on profit models, applications are often monetized and have also been found engaging in predatory tactics [5, 85]. Their marketing and sales tactics often profile students based on pervasive profiling, which are used to lure parents and students into opting for such applications [85]. This has attracted multiple complaints of people being duped by such applications, especially the parents and students from a low-income background, who are pushed to take a loan and work overtime, to afford subscriptions to such applications [5, 85].

Moreover, there is a need to support off-line search and access to relevant content and provide it at a low cost. Therefore, there is a need for HCI research to explore contextual computing tools that provide searching and curating relevant content easier using public resources like YouTube or Khan Academy and could also

work without continuous internet connectivity. The teachers also used WhatsApp to collaborate among themselves. They used WhatsApp for sharing material, discussing teaching practices, and so on. The easy interface and ubiquity of WhatsApp facilitate collaboration. The network requirements of WhatsApp are also minimal. However, there is a need to sustain the conversations and preserve the resources shared on WhatsApp for a sustainable solution. The computing tools should also facilitate easy collaboration among different stakeholders with means to preserve resources shared during communication. Also, recently the Govt. of India has launched a new Education Platform named DIKSHA¹³ (means delivering education/knowledge/skill). The DIKSHA platform aims to provide content in local languages across India. However, the platform is still under development, and content for Kashmir is only available in English so far, as was also highlighted by our participant (see section 4.3.4). Furthermore, the portal's navigation is not easy and requires one to have prior technology exposure for searching the right content. While such initiatives are commended, the need is to develop tools that can augment local teachers in creating their own list of curated education content that they can share with students and among each other.

6 STUDY LIMITATIONS

Our study was conducted in collaboration with an NGO, and the participants were recruited through purposive and snowball sampling who were associated with the community learning centers. Furthermore, due to the restrictions imposed by COVID-19 and the official closure of schools, we were unable to engage the stakeholders from the formal educational setup (e.g., teachers, administration). Their perspectives could have added more insights that could be explored as future work. Since this work focuses on the primary level educational challenges, we plan to engage with secondary and higher education systems as future work.

7 CONCLUSION

Through our qualitative study in the context of Kashmir, we highlight the concerning situation present on the ground due to the decades-long socio-political disruptions in the state, which has disparately affected people's lives and their aspirations. We found out that the deeply embedded nature of the 'uncertainty' due to disruptions has had a severe impact on the educational ecosystem and technology infrastructure. Initiatives like Community Learning Centres have built a strong support system within communities to handle such infrastructural and technological breakdowns and continue imparting education via leveraging the existing human infrastructure. Our analysis highlights the need for scaffolding such initiatives within these contextual constraints by leveraging the human-intermediated technology infrastructure for improved scalability and sustainability. However, we also acknowledge that some of the highlighted problem are beyond the scope of HCI research which technology cannot fix. But technology maybe able to assist in addressing some of the concerns that people or communities living within the contexts of ongoing disruption face around the umbrella of educational ecosystems. Overall, our study expands the conversation and understanding of the HCI community and

emphasizes that it is of utmost importance for researchers to engage with conflict-affected communities across the globe, to understand such critical design challenges, which are often shadowed by the mainstream progression of educational technology.

ACKNOWLEDGMENTS

We want to extend our sincere gratitude to the NGO for their help and support throughout this study. We want to thank Irfan Shahmiri, Afifa Lone, Gulzar Ahmad Wani, and the entire team & staff of the organization for their support and cooperation throughout this project's journey. Our special thanks to Gulzar Ahmad Wani for his continued support, time, and assistance during the data collection. We would also like to thank all our participants for sharing their stories and engaging in interviews. We acknowledge the support provided by iHub-Anubhuti IIITD Foundation. We would also like to thank our anonymous reviewers for their valuable feedback.

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¹³<https://diksha.gov.in/>

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