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Article

Rural–Urban, Gender, and Digital Divides during the COVID-19 Lockdown: A Multi-Layered Study

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Abstract: This study explores digital divide issues that influenced online learning activities during the COVID-19 lockdown in five developing countries in South Asia. A multi-layered and interpretive analytical lens guided by three interrelated perspectives—structure, cultural practices, and agency—revealed various nuanced aspects across location-based (i.e., rural vs. urban) and across gendered (i.e., male vs. female) student groups. A key message that emerged from our investigation was the subtle ways in which the digital divide is experienced, specifically by female students and by students from rural backgrounds. Female students face more structural and cultural impositions than male students, which restricts them from fully availing digital learning opportunities. Rich empirical evidence shows these impositions are further exacerbated at times of crisis, leading to a lack of learning (agency) for women. This research has provided a gendered and regional outlook on digital discriminations and other inequalities that came to the forefront during the COVID-19 lockdown. This study is especially relevant as online learning is being touted as the next step in digitization; therefore, it can inform educational policymaking and help build inclusive digital societies and bridge current gender and regional divisions.

Keywords: rural vs. urban divide; digital divide; gender divide; online study; COVID-19 lockdown



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1. Introduction

Social, economic, regional, and environmental factors can lead to increased gendered divides, such as women being given lesser financial powers, having fewer digital opportunities, or holding more unpaid household responsibilities compared to others. These gender divides tend to increase disproportionately in crisis situations, such as during pandemics or wars, as women often face more societal restrictions than men during such times [1]. An OECD (Organization for Economic Co-operation and Development) report suggested deeper underlying gender discrimination, stating that fewer women own smartphones or have access to mobile internet and this, in turn, curtails digital opportunities that would otherwise have been availed by them [2]. Moreover, social expectations in families are different for men compared to women, even if both are employed or are at the same level of study in school, college, or university. The recent COVID-19 lockdown enforced stay-at-home orders that led to women being given more household responsibilities, including cooking, cleaning, childcare, and elderly care, among others [3], which resulted in further widening of the already existing gender divides. In this study, we investigate digital learning opportunities that could (or could not) be availed at the time of the lockdown imposed by the pandemic. The lockdown forced educational institutions to close their campuses; therefore, students enrolled in these institutions had to pursue studies online from within their homes.

We provide a gendered perspective by surveying male and female students from five developing countries, namely Afghanistan, Bangladesh, India, Nepal, and Pakistan. Additionally, we examined both digital opportunities and challenges that were faced by students residing in rural and urban locations during the lockdown. The 2022 network readiness index (NRI) proposed by the World Economic Forum (WEF) provided a structured assessment of the current digital infrastructure of 131 countries across 4 pillars, namely technology, people, governance, and impact [4]. It provides an overview of each country's current technological, social, economic, geographical strengths and weaknesses, and overall future readiness to adopt digital solutions from lessons learned during the COVID-19 pandemic. In the countries surveyed, except for Afghanistan, for which no ranking was available, the remaining four countries grouped as lower-middle income are shown in Table 1. While the digital development of these countries has been relatively nascent compared to higher-income countries, these countries are now seen to be growing across the four pillars in their digital readiness. Moreover, these five countries are geographically contiguous regions in South Asia, and while they share some common colonial and historical heritage, there also exists some regional and national socio-cultural differences. Cross-cultural research studies have identified economic development, geographic region, country history, and societal values as influencing regional/national cultures [5]. This study acknowledges that regional differences would come into play; however, the consideration of country-specific cultural norms is outside the scope of this study. The survey, therefore, has provided a shared perspective on digital readiness for online learning as perceived by students who are citizens of these five countries.

Table 1. Comparison: network readiness index across the four pillars.

Country	Technology	People	Governance	Impact	NRI
Bangladesh	81	92	101	88	88
India	56	46	83	62	61
Nepal	112	117	109	101	112
Pakistan	59	87	116	90	89

This study integrates ideas from previous research and survey data gathered from 827 student participants, the majority of whom were at a tertiary level of study, while some were at a higher secondary level. Pachler et al.'s [6] socio-cultural framework provided a lens to analyze the impact of existing digital divides from a learning context based on a rural–urban and gendered stance. We examined multiple layers, namely structural (i.e., how online study is constrained by existing digital infrastructure and reach), cultural (i.e., how institutional and home environments influence online study), and agency (i.e., whether the previously uncharted online learning landscape provided students with some feeling of control over their learning actions in achieving their learning outcomes). Learner agencies are enhanced as users build competencies with a meaningful appropriation of digital resources across the breadth of learning in formal and informal contexts [6,7]. That is, by properly engaging with digital media in both contexts, the habitus of learning evolves as learners enhance their agency to achieve desired learning outcomes [8]. The COVID-19 pandemic has shaken up traditional educational practices, and learnings from these pandemic-induced disruptions have revealed that present-day educational institutions need to be more agile in their digital preparedness so that students are better positioned for online learning in a future event that requires sudden change. Therefore, it is essential to plan futuristic digital policies to facilitate more inclusive online learning environments. This study contributes to digital divide research by highlighting the online learning opportunities and challenges faced by students at the time of the COVID-19 lockdown. We bring forth student voices regarding their online learning experiences, which in turn could inform educational policymakers on planning future digitization strategies in developing countries.

This research seeks to gain an understanding of the dependence and feasibility of digitization in societies that do not have equitable views toward gender, and which are also constrained by limited digital infrastructure. The COVID-19 lockdown highlighted the differential learning experiences from a rural vs. urban and a male vs. female context. Therefore, we explored online learning experiences of different student groups (i.e., male vs. female students and students from urban vs. rural backgrounds) during the COVID-19 lockdown to answer the following three research questions:

1. What online learning challenges were faced regarding digital media access and network connectivity across the different student groups?
2. How did cultural norms and beliefs affect online learning opportunities across the different student groups?
3. In what way did the online learning environment impact learner engagement and influence learner agency across the different student groups?

Pachler, Cook, and Bachmair's [6] socio-cultural framework underpinned our analysis. Survey data gathered from 827 student participants provided rich insights on gender-based and region-based digital discriminations that currently exist in developing economies. This study contributes to educational policymaking by bridging existing digital divisions and building more inclusive online learning spaces to enhance the students' overall learning experiences.

2. Learning Challenges during the COVID-19 Lockdown

The coronavirus disease triggered global lockdowns and brought in new health guidelines, such as wearing face masks in public places, following good hygiene practices, maintaining physical distancing, and avoiding mass gathering [9]. It also endorsed the move toward online learning, although many parts of the world witnessed a collapse in the effective implementation of online education deliveries [10]. While governments of countries affected by the pandemic directed the immediate implementation of online education, in reality, many educational institutions were not prepared for making this abrupt transition from on-campus to online mode. Having always conducted on-campus teaching, these institutions had limited digital infrastructure for translating physical classes to virtual classes (e.g., converting seminars to webinars, conducting online assessments, etc.). They further lacked pedagogic practice in making meaningful use of technology. Mishra et al. [10] note many infrastructural challenges, such as unstable network connectivity or electricity interruptions. Moreover, teachers were seen launching into monologue rather than dialogue. This could be because teachers and students could not see each other's facial expressions, which could help them gauge each other's moods; therefore, online dialogue was minimal. Furthermore, students located in remote regions lacked proper digital equipment, which restricted them from actively participating in online classes. Moreover, many teachers preferred using familiar communication tools, such as WhatsApp, rather than using more advanced online learning platforms (e.g., Zoom, Telegram, or SoloLearn), which would enable them to deliver online learning activities more meaningfully [11]. Another online learning initiative "Suspending Classes Without Stopping Learning" launched in China during the lockdown was fraught with complexities [12]. For instance, many educational institutions with no prior experience with online education were left to fend for themselves. Teachers and students were not equipped with digital tools and their home environments were not conducive for online teaching and learning. Additional challenges related to the lack of digital infrastructural support due to financial constraints or far-away rural locations. The authors call on governments to optimize online education programs with high-quality broadband, make use of standardized home-based teaching equipment, and ensure proper teacher training.

Another study has discussed how the COVID-19 lockdown exacerbated inequalities across socio-economic backgrounds, education, gender, ethnicity, and geography [13]. Job losses, business closures, and loss of contractual work led to financial hardships, and many parents who incurred income losses during the lockdown complained that their children

had to face further discrimination [14]. Some secondary schools removed students' names from WhatsApp teaching groups because their school fees were not paid, adding to the struggles and anxiety levels among parents and students. Tadesse and Muluye [15] further point out that teachers themselves faced financial struggles, as some schools did not pay teachers full salaries during the crisis times. In addition, teachers encountered challenges identifying new online assessment and evaluation methods that they deemed to be fair and that did not disadvantage those students who may already be in vulnerable positions. Consequently, the sudden lockdowns increased inequalities among teachers, students, and families.

The above literature highlighted some of the learning challenges faced during the COVID-19 lockdown from an institutional and an individual (i.e., teacher, student, and parent) perspective. Low levels of internet penetration, insufficient/inadequate digital devices, financial constraints, and a lack of online classroom experiences are seen to contribute to these learning challenges. Transitioning from on-campus to online learning was difficult for educators, students, and parents who were forced to adopt a completely online environment without any prior preparation. Researchers need to highlight these learning difficulties and bring awareness of the challenges faced during the lockdown. Factual evidence from individuals who had undergone learning difficulties with online education deliveries can assist governments and institutions in providing proper online resources and learning support to engage students productively [16]. Such evidence must be analyzed in a manner that can inform policymakers on finding ways of introducing digital learning in a more meaningful manner. The next section describes the analytical framework that has been used for analyzing the empirical data gathered from an online survey of students conducted in five developing countries.

3. Analytical Framework

Prior studies on the digital divide in learning opportunities suggest that the lack of equity in the technology space is a product of inequity in socioeconomic status, differences in the cultural appropriation of contemporary digital technologies, and gender-based stereotyping [17]. While recent advances in technology have impacted societies that have led to a spillover effect across these social and cultural boundaries, the historical bias (especially within economically disadvantaged societies) is still contributing to the treatment of women "as technically incompetent or invisible in technical spheres" [18] (p. 144). Feminists have raised concerns surrounding the impact of gender gaps (from a perspective of gender stereotyping) in diverse fields such as science, technology, and media use. Concerns are that girls (particularly school and college students) are seen to lag behind their male counterparts in regard to the use of digital technologies as a consequence of gender biases. To understand how far these concerns reflect the reality across different countries (especially in South Asia where these barriers are at a much larger scale), empirical data was gathered to gauge first-hand experiences with online learning during the COVID-19 lockdown.

Pachler et al.'s [6] socio-ecological framework underpins our analysis of gender and technology positioning in online learning environments. The framework delineates three analytical perspectives, namely structure, culture, and agency. Structure relates to how information and communication technologies (ICTs) are accessed by students in on-campus and online learning spaces. Specifically, during the lockdown, in the online space, the students were confined to their home/living settings; therefore, this is referred to as an informal learning space, while the on-campus space is referred to as a formal learning space. Learner engagement with ICTs is further impacted by the socio-cultural environments in which they are located. For instance, students from rural regions may not be equipped with appropriate ICTs that fit their online learning needs [16]. Moreover, societies often lay out gender expectations within households and communities based on cultural norms. At times of financial hardships or other difficulties, these gender expectations often get reinforced in familial groups [19] such that women are burdened with more household chores than men. Finally, within these underlying structural and cultural norms, the third perspective looks

at how learners incorporate ICTs into their learning practice for enhancing their agency and successfully achieving learning outcomes.

While the ongoing evolution of education technologies is transforming education deliveries worldwide from the conventional on-campus mode to online mode, much of the developing world cannot do the same due to its limited digital infrastructure. An OECD report states that the way ICTs permeate societies in South Asian countries can be gendered; that is, women are on average 70% less likely than men to have a smartphone or mobile internet connection [2]. This disparity in digital media reach, coupled with a lack of network connectivity, leads to greater digital inequality. In this study, the structural aspects related to ICTs as modes of appropriation for online learning across rural and urban regions during the COVID-19 lockdown period are explored. The cultural aspect relates to gendered expectations and home conversations that surround students when they use ICTs for online study from inside their homes. This leads to questions regarding learner agencies. How do these students try to fit themselves within the given structural and cultural constraints to engage with online learning? That is, is digital media merely being used as a tool for content delivery or is it motivating learners to use digital media for online learning, thereby improving their capabilities? Learning experiences are tied to everyday cultural practices within the available technological structures; so, learning (opportunities and agencies) among students can be further constrained by location (rural–urban) and gender (male–female) divides.

Pachler et al. [6] refer to the importance of situatedness in online learning since pedagogical approaches are subject to the convergence of media and the subject being discussed, which “cannot simply be transported by signs, images, words, etc” (p. 7). They refer to the intersectionality of agency, cultural practices, and structural norms as an ecology that molds the habitus of learning with digital media in everyday life situations (in schools, homes, or workplaces). The three perspectives, namely structure, culture, and agency, intervene as learners construct knowledge within their learning spaces. Unfortunately, at the time of the COVID-19 lockdown, online learning spaces were affected by socio-digital inequalities related to family situations (e.g., financial standing, home chores, availability and access to digital media, and overall attitude toward education) [11,16]. Hence, we placed these three perspectives at the core of our analysis to make sense of online learning experiences from a gendered and regional context. Figure 1 illustrates this interplay between structure, culture, and agency in the context of our study.

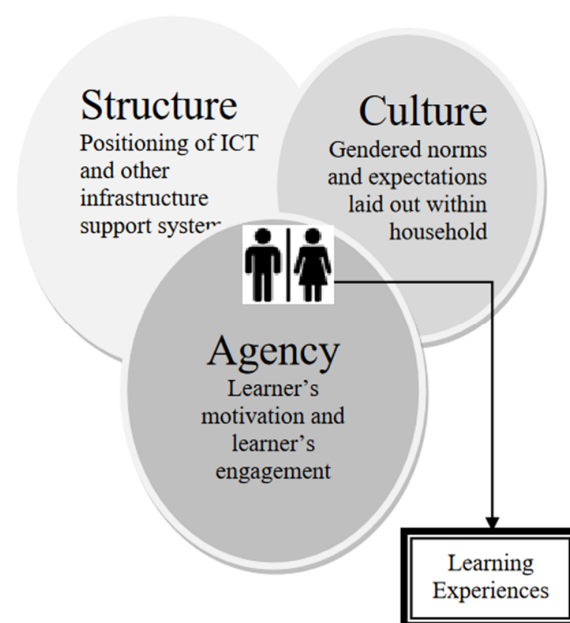


Figure 1. The interplay between structure, culture, and agency in the context of this study.

4. Research Methods

An online survey instrument was distributed to students residing in five countries, namely Afghanistan, Bangladesh, India, Nepal, and Pakistan. The survey questions were derived from the digital divide questionnaire adopted by Wei, Teo, Chan, and Tan [20] and were adapted to the context of this study. Data was collected between October 2020 and April 2021, which was the time when the lockdown was enforced across most parts of the world and the hunt for an effective strategy to combat the spread of the virus was ongoing. The responses from the survey instrument, therefore, reflect the student perceptions when they were in the midst of the raging pandemic rather than being retrospective in nature. This specific time, we believe, adds more realism since it reveals the participants' raw feelings, which have then been analyzed from the three analytical perspectives (shown in Figure 1). Survey questions relating to participants' gender, their level of study, and country region (rural or urban) were put forth. Additional questions investigated structural issues (e.g., technical infrastructural support), cultural issues (e.g., household responsibilities), and agency (e.g., engagement levels). Finally, open-ended questions aimed to gauge students' positive and negative experiences with online learning to provide clarity on the ground reality of online learning across rural and urban regions were given. The survey was voluntary, and we did not collect any personally identifiable data of any of the participants.

5. Study Findings

This section reports the empirical data gathered via survey responses. Overall, 827 students mainly pursuing a tertiary level of study (with few being at a higher secondary level) from the five mentioned countries participated in the survey. The male and female participants were evenly balanced: 416 males (50.3%) and 411 females (49.7%). Of these, half of the male students reported their location as rural (i.e., small towns or villages) compared to 30% of female students (Figure 2A). A further breakup of student populations by country (Afghanistan, Bangladesh, India, Nepal, and Pakistan), gender (male and female), and location (rural and urban) are shown in Figure 2B,C.

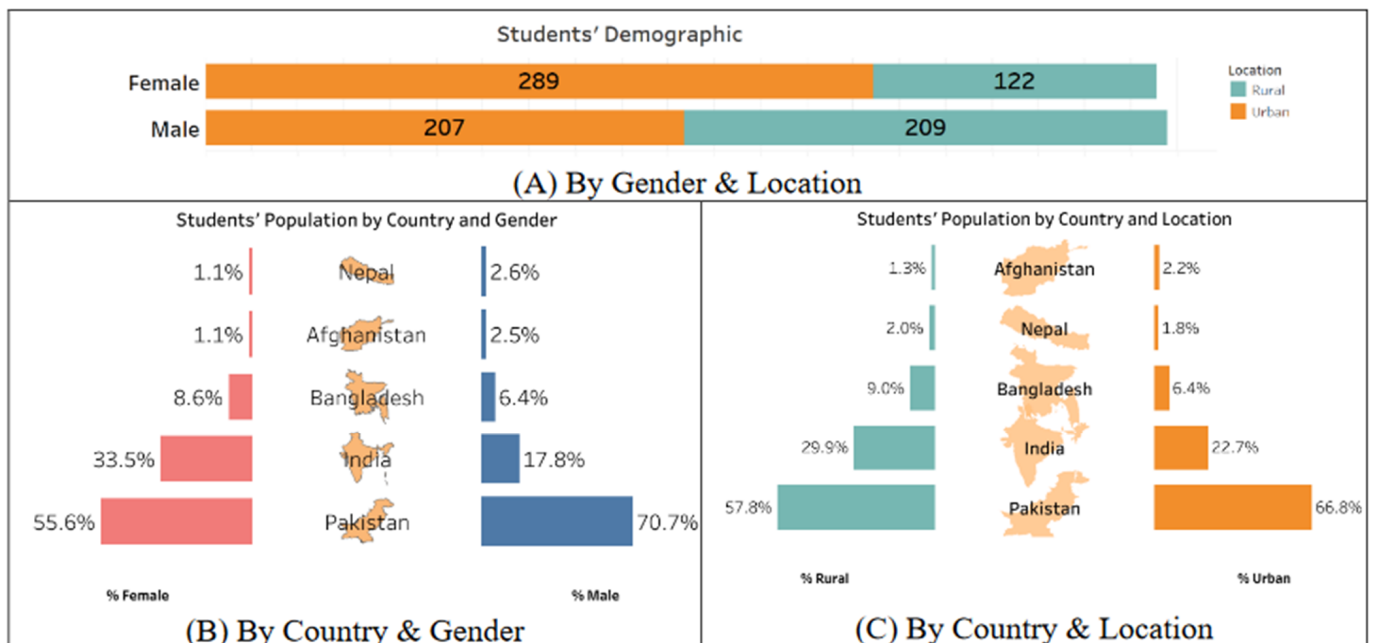


Figure 2. Break up: student populations.

Overall, 40% of survey participants were from rural areas (although structural limitations prevented many others from rural backgrounds to participate in this study), and 60% of them were from urban areas. This rural–urban data segregation becomes important

as it brings out deeper divides based on gender, as well as proximity to technological means. This impacts the learner's agency which is, in turn, influenced by the structural and cultural boundaries in which the learner exists. The following subsections provide a deeper multi-layered digital divide analysis from a gender and rural–urban viewpoint using the socio-cultural and ecological framework (Figure 1). To gauge students' online learning experiences, the survey questioned students about their structural surroundings (i.e., type of devices used, quality of internet connection, etc.), cultural practices (i.e., home environments, gendered responsibilities, etc.), and learner agency (i.e., learner motivation, learner engagement, and learning outcomes that were achieved). Findings related to the rural–urban digital gender divide within each perspective, as described by the socio-cultural and ecological framework, are presented next. The study explains how each of the three areas—structure, cultural practices, and learner agency—take shape and what relationships emerge as a consequence of their interactions.

5.1. Structure

The COVID-19 pandemic forced the entire population to increasingly rely on digital technologies. Teachers and students in rural areas already face technology barriers and operate in less favorable learning environments compared to their urban counterparts [21]. Our study finds rural populations to be more at risk with limited technological infrastructure available to them. With the country-wide explosion of demand for online services, further intensified by the pandemic, residents of rural areas who have limited reach to stable infrastructure and who mainly depend on basic mobile phones for network connectivity were faced with more hurdles. This contributed to students from rural settings having more learning difficulties. Specifically, women found themselves placed even more precariously as their household responsibilities and limited mobility prospects guided by familial structures impacted their online learning experiences. Additionally, the quality of their mobile devices and network connectivity are much more deficient in rural areas in comparison to urban settings. Different studies indicated a similar plight of digital exclusion, most notably for women from rural locations. These studies also report that fewer women own mobile devices, which is further impacted by the surrounding structural environments and, therefore, varies across rural and urban regions [2,22]. Rotondi et al. [18] note that the interaction between gender and household location of residence can lead to multiple disadvantages, especially for women in rural areas. Our study affirms this aspect of the digital gender divide in terms of the type of device used and internet access across rural and urban areas. Data on these structural challenges during the COVID-19 lockdown have been segregated and compared by gender and by region in Figure 3. Female students are seen to be more disadvantaged overall regarding digital media ownership, internet access (Figure 3A), and the quality of internet connection, which further widened the gap between students in rural and urban regions (Figure 3B). Keeping these responses in context, we see that female students in rural areas are more constrained; they do not have proper devices or good online connectivity, which hinder their study and lead to a lesser fulfilling learning experience.

A deeper investigation revealed mobile phone ownership to be less for female students (37%) compared to their male counterparts (63%) in both rural and urban regions. Some females reported the use of mobile devices that were borrowed from close family members for the study's duration. Two quotes representative of such lived experiences by female students are: *"I have no personal phone, only one phone in my home which was used by my father and my brother also because he also joins the online class at the same time, so I face many problems"* and *"I use my aunt's smartphone, and sometimes my classes are missed as recharge gets expired"*. By providing representative data extracts (e.g., direct quotations from participants), researchers can provide more context to individual experiences and add more strength to their analysis and findings [23].

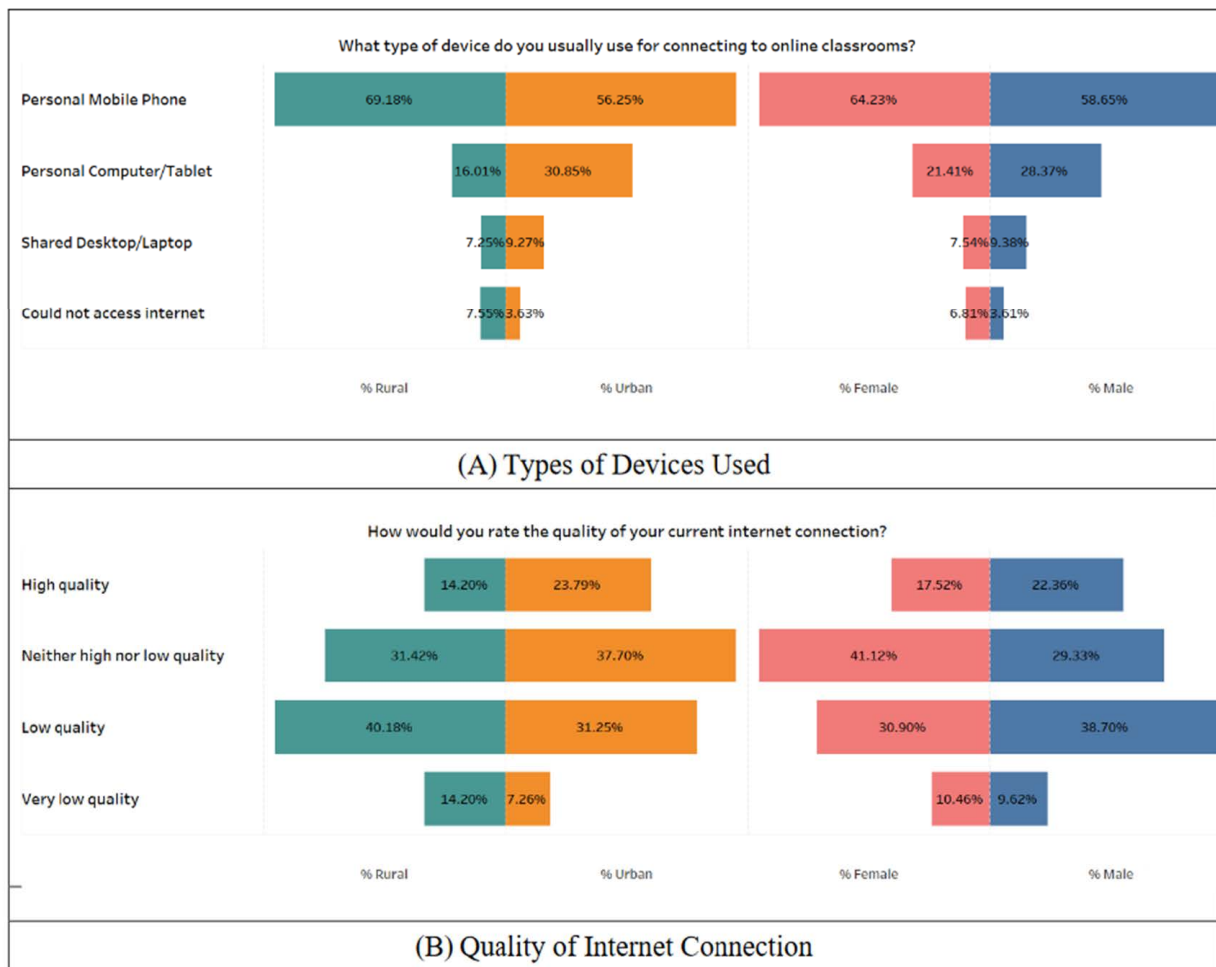


Figure 3. Structural perspectives: gender and region comparisons.

In addition, the rural region shows a further gendered divide in terms of the ownership of computing devices; that is, 29% of female students reported having personal computers at home compared to 38% of male students, although a quarter of each gender group reported that they had to share the computer with other siblings at home. More female participants voiced issues of limited internet access due to inadequate devices, poor network connectivity, or having small data packages. The quality of internet connection showed marked differences across rural and urban regions. We posed an ordinal scaled statement on the quality of internet connection (ranging from very low, low, neither high nor low, and high). While urban regions reported similar proportions of low- and high-quality internet connections among genders, a higher proportion of female students reported more dissatisfaction with the quality of their internet connectivity compared to males (refer Figure 3B).

5.2. Cultural Practices

The findings reveal that cultural impositions in home environments for undertaking online study are much higher for women in rural areas than for the other participants (in rural and urban areas combined). However, when looking deeper, women in urban areas also found themselves in more unfavorable positions regarding familial expectations compared to the men in the same space, which ultimately hindered their learning. Figure 4 represents gender-wise challenges at home in rural and urban areas in terms of resources based on socio-cultural norms. Five statements with a 7-point Likert scale (ranging from strongly agree, agree, somewhat agree, neither agree nor disagree, somewhat disagree, disagree, and strongly disagree) have been interpreted with an NPS (net promoter score)

to gain insight into student perspectives. The NPS provides agreeing–disagreeing scores based on overall response distributions. A positive NPS percentage value indicates more agreement than disagreement. It is commonly used in marketing surveys, though its influence and usage have drawn some criticism [24]; however Brown [25] adds that an NPS has much influence when it is used in multi-item scales, as opposed to a single-item scale, which is commonly used in marketing surveys [26]. In this study, multiple statements were put forth, and the NPS value for each statement is shown in Figure 4.

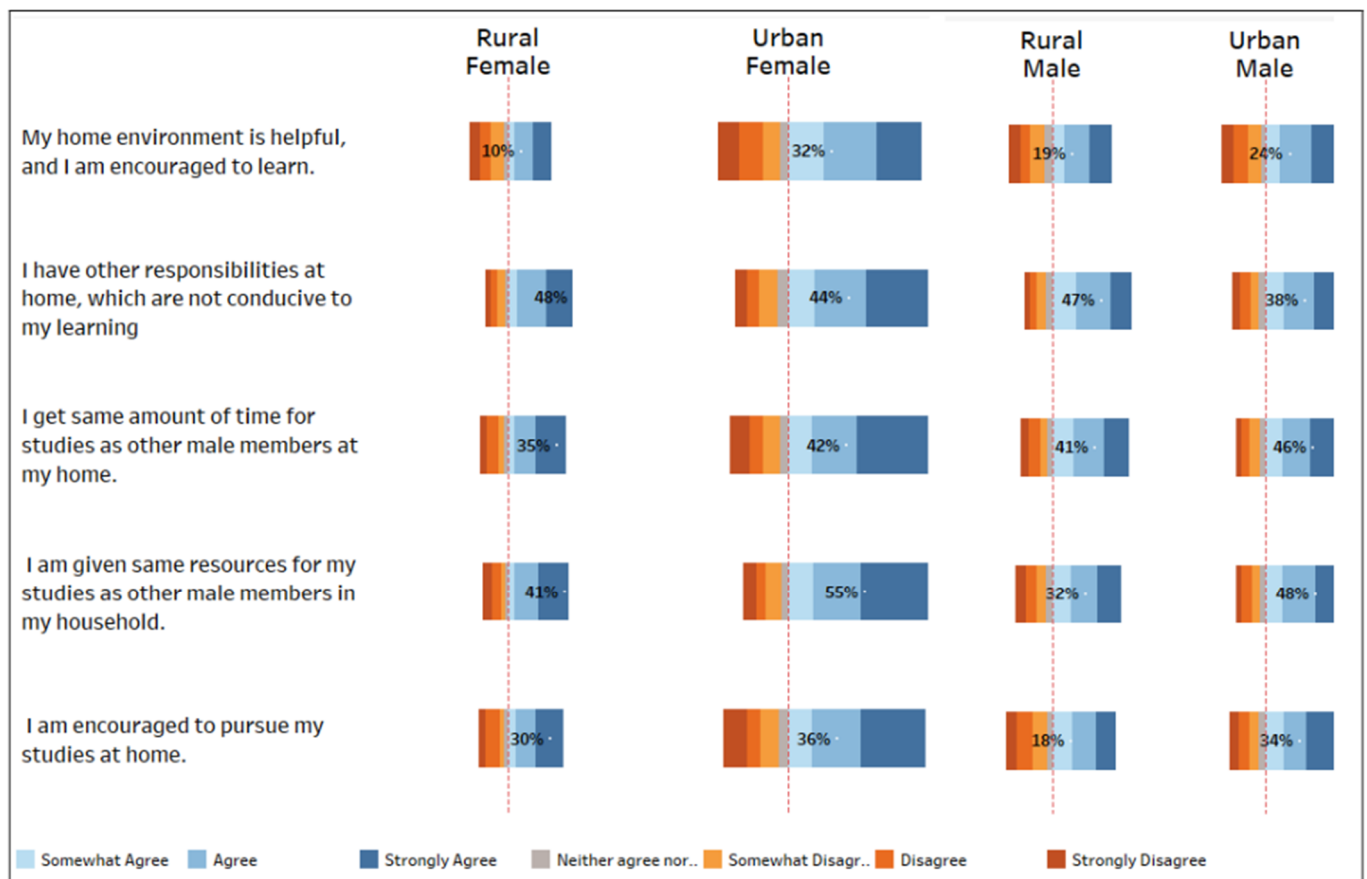


Figure 4. Cultural perspectives: gender and region comparisons.

In response to the statement “My home environment is helpful, and I am encouraged to learn”, the lowest NPS scores show the most disagreement among females residing in rural areas (10%), while other responses are mixed. The statement “I have other responsibilities at home, which are not conducive to my learning”, shows similar NPS values (47–48%) for female and male students residing in rural areas; therefore, students in rural regions are more hampered with household responsibilities. The statements “I am given same resources for my studies as other male members in my household” and “I get the same amount of time for studies as other male members at my home” pointedly refer to the gender divide based on cultural practices. Here, we specifically refer to how women interpret their position in terms of digital opportunities compared to men. For men, this statement does not convey much, as here they may be comparing themselves with other male members (father, siblings, etc.). Overall, we find that women in rural regions perceive their position to be less equal to men and even lesser than women in urban regions; therefore, cultural norms appear to be more prejudiced toward women in rural regions. These traditional views further add to the pre-existing cultural norms and household responsibilities, which weigh women down in these countries. The structural factors that contribute to the technology access gap between regions can impact perceptions related to cognitive and social access [27,28]. Cognitive access depends on an individual’s actual

and perceived skills to access the technology while social access refers to the cultural norms and resources embedded in societal groups [27,29]. Cognitive skills reflect the social environment that depends on what support and encouragement are provided. Overall, the findings show that women hold lower positions in the cultural groups in both rural and urban areas.

5.3. Agency

Learner agency is a consequence of how learning opportunities can be availed of in the given structural and cultural scenarios. Figure 5 gives learner responses to perceptions regarding agency in the context of online learning. These survey questions have been adapted from Wei et al.'s questionnaire [20] for this study. When asked to rank whether online learning made them more independent learners, the underlying response across genders and regions showed similar responses, with a slight shift toward agreement. However, all the remaining other statements show a negative impact of online learning for women, and more so in rural regions. When asked if online learning developed their ability to ask critical questions, the female students did not consider this to be the case. Similar inequitable outcomes were revealed for women compared to men when they were asked whether online learning enlarged their scope beyond textbooks, made them more knowledgeable, or helped them achieve better results. The female students felt more isolated and voiced that not being able to communicate with their teachers was an obstacle to their learning. Women, in particular, had less access to smartphones, which has also been viewed as a solution for isolation since it allows avenues for entertainment and social interaction [30]. Overall, the responses from students (both male and female) showed that learner agency did not enhance with online learning during the lockdown, although this response was more prevalent among female students. This is no surprise, as online learning opportunities can only be availed with learners' engagement in the everyday use of technology (involving all sorts of activities across leisure, entertainment, and learning) which, in turn, drives up learner self-efficacy and builds agency [31]. However, everyday lives changed with the pandemic rules. For instance, the concept of a "bubble", representing a fragile shared space, has emerged [32]. Outside one's bubble, people followed the newly found behavioral practices associated with physical distancing and social isolation. Therefore, students were physically constrained; they could not socialize outside family spaces and could no longer build upon the social closeness that was formed earlier with on-campus classroom experiences [9]. Feng et al. [33] advise researchers to conduct gender-based studies using large sample sizes to examine the impact of social closeness on learner agency in online learning environments. Our study finds that female students, irrespective of their location, found social interactions with their peers to be much more restricted during online study at the time of the COVID-19 lockdown in comparison to male students.

Moreover, in developing countries, many segments of the lower- and middle-income populations across rural and urban locations reside in small, congested settlements that lack proper drainage, sanitation, and ventilation [34–36]. Isolation would have put more burden on these families. Further, homes can be associated with negative experiences (e.g., boredom, obligations, imprisonment, tiredness, repression, and domestic violence) or with positive aspects of comfort (e.g., casual dressing, tranquility, fewer obligations, and relaxation) [37]. Hence, everyday interactions, family structures, cultural routines, and gender identities prevalent in households could no longer be ignored. The next section discusses some of these everyday experiences.

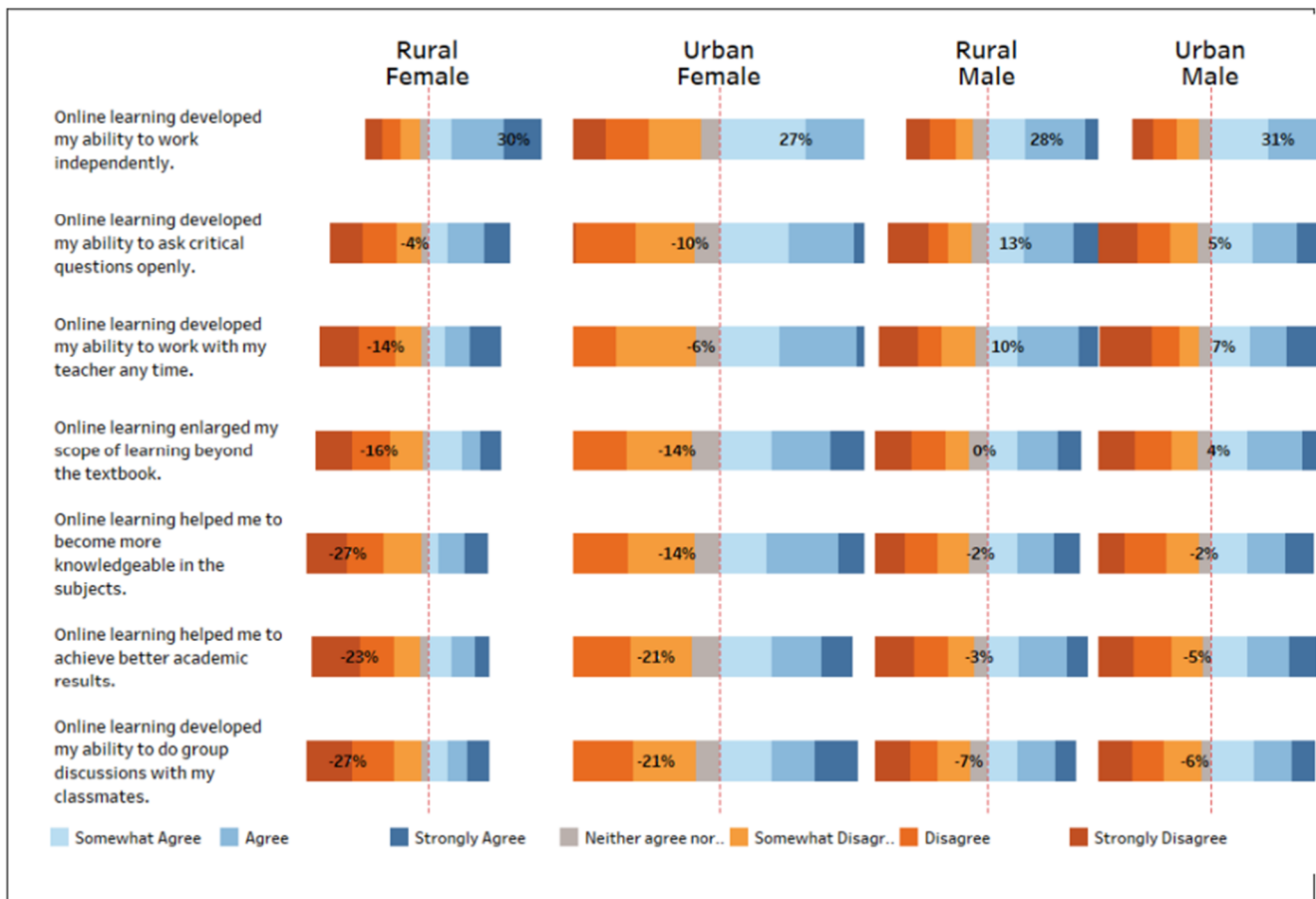


Figure 5. Agency perspectives: gender and region comparisons.

6. Discussion

This section provides a multi-layered view of online learning experiences using a gendered and a regional lens to answer the three research questions that have been posed. We first consolidate participant responses to the open-ended survey questions. The author team analyzed each response and placed them into relevant categories relating to online learning challenges and opportunities. Communication barriers, financial constraints, health issues, a lack of focus, equity and accessibility issues, technical/internet issues, and a lack of social support were identified as some of the challenges, while convenience in peer interaction, increased knowledge of technology, flexible/self-paced learning, good social support, and no commute time illustrate opportunities. Figure 6 provides an overview of the percentage of responses that fit into different categories based on gender and location.

We find some significant differences based on gender and location. The most significant gender-based differences are that male students perceive online learning has provided them with more opportunities (i.e., a flexible and self-paced learning environment (23%), assisted them in developing knowledge about technology (14%), and encouraged peer interaction (5%)). On the other hand, female students perceive more challenges (i.e., a lack of social support (14%), equity and accessibility issues (5%), and barriers in communication (5%)). Both male and female students reported technical issues, although more females voiced technical challenges in comparison to males. Broadly, as evidenced by Figure 6A, more challenges were put forth by female students. Further, a significant revelation from the location-based comparison (Figure 3B) is that more students situated in rural locations reported internet connectivity and other technical issues, while those in urban locations considered that online learning environments provided them flexibility and encouraged self-paced learning. Nguyen et al. [38] noted that during the COVID-19 pandemic, digital inequalities varied among individuals based on their sociodemographic status, location,

and gender. Whereas higher-income families upgraded their internet plans, lower-income families who previously relied on budgeted services, such as public options for internet access, struggled with their increased utility of internet services. Another study conducted in the Netherlands [39] re-iterates these findings and adds that digital inequalities rose during the pandemic as a consequence of existing social and information inequalities. It finds that typically, men were seen to be more engaged digitally than women and that less socially advantaged individuals were further marginalized at the time of the COVID crisis. The study concludes that countries with less household internet penetration compared to the Netherlands would have observed even more digital inequalities. While both these studies have shed some light on vulnerable populations at the time of the COVID-19 crisis, they provide a high-level view of general populations. This study delves deeper into specific student populations (primarily those enrolled at a tertiary level of study) to reveal existing digital divides and the extent to which students were challenged based on their gender and their location (characterized by low or high household internet penetration). Survey data from 827 students have grounded our empirical investigation and provided answers to the three research questions that have been posed. The three research questions are answered next.

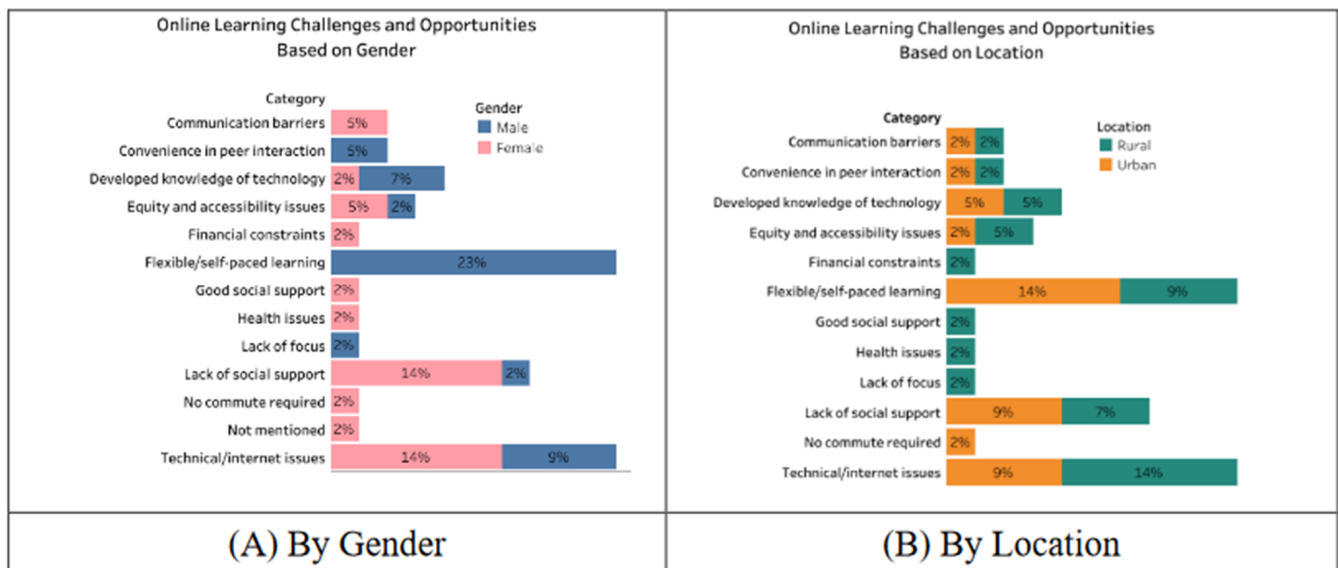


Figure 6. Online learning challenges and opportunities: gender and region comparisons.

Based on the empirical evidence provided, we now attempt to answer the first research question. The findings suggest that access to digital technology indeed affected the learning of male and female students differently in online environments. Female students reported more household responsibilities, less encouragement from immediate family members for their study, communication barriers that restricted them from openly asking questions in online forums, and less peer interaction. Many female students added that they used simple phones (that were limited in screen size and memory capacity) for study, did not have access to a computer, and often had to share devices with siblings. These challenges were voiced to a lesser extent by male students. Moreover, rural regions faced more challenges, as has also been voiced in another study in the Bhutan region [16]. Challenges included data package limits, internet connectivity issues, and equity and accessibility issues that, in turn, led to poor communication channels with teachers and peers.

The second research question investigates the cultural norms and beliefs that affected different student groups. Our findings indicate that female students are constrained by more societal and familial expectations, such as taking care of guests, having to do household chores, and not being given a personal space for study, unlike male family members. These obstacles get exacerbated in rural societies. Females are also excluded

from digital resources, with a few of them reporting that they could use the mobile phone for learning only after the male family members had finished their use of it. Male students, on the other hand, were not subjected to such cultural norms, rather they expressed that they enjoyed the home learning environments, except for the internet connectivity and other technical issues. Moreover, students from rural regions did not get as much support from their parents as students from urban regions. This is not surprising, as rural regions would not be as connected to the outside world and, therefore, considered continuous internet access as an unnecessary expense. Table 2 provides some examples of participants voices showcasing gendered views from a structural and a cultural perspective.

Table 2. Multi-layered analysis: participant voices.

Layer 1	Layer 2	Layer 3
Structure	Male	Rural: (1) Have faced many difficulties like low speed of network and sometimes there is no network in my village; (2) I just learnt how to use computer like MS word, power point, etc.; (3) I could not take many online classes; (4) No tension on what to wear and go; (5) Always it is network problem or electricity problem; (6) It is unfortunate that we are living in that part of world where internet access is left to mere 2G speed having a maximum of 40–50 kb/s. Urban: (1) Load shedding, low quality internet and asking questions during lectures; (2) We can do revision by watching the lecture again; (3) I got more time to read; (4) I was able to learn anytime; (5) The positive thing about online learning is that people who knew less about technology are now trying to learn more about it; (6) We have only one phone at my home. With that phone we all have to take class—my siblings and me also.
	Female	Rural: (1) Electricity issues, slow internet connection; (2) I had less time for my studies and my internet was really slow, so I don't prefer online classes; (3) We didn't have online classes just we got our lectures (4) Physically draining like eyesight problems; (5) There are many issues that can't be explained here; (6) My father doesn't have that much income to have an Internet connection so I was not having Internet at all which pushed me behind; (7) Online classes are useless for us who have poor internet connectivity. Urban: (1) Internet issues, light problem, home environment (sudden guests); (2) Power off due that sometime the mobile or laptop couldn't be charged properly; (3) Many things went unclear, and we cannot ask questions because most of time we had been asked to keep our devices mute; (4) I got to know about different platforms used for online studies; (5) Lack of concentration due to presence of each family member at home at the same time; (6) No travelling.
Culture	Male	Rural: (1) I cannot give much time to studies as our home environment is not so good for studying; (2) My mind gets easily diverted because it's my first time having online classes; (3) Yeh we had a lot of free time ^_^; (4) I could ask questions that I might have hesitated to ask in class; (5) Was comfortable; (5) I had plenty of time and learned new skills. Urban: (1) In online classes, we can ask questions without hesitation; (2) Now I give more time to my family 😊; (3) Well online learning gives people time to study on their own proper terms and that to me is the greatest advantage any student can receive; (4) It is very comfortable; (5) I had plenty of time which encouraged me to learn new skills.
	Female	Rural: (1) Whenever I take my own classes same time my brother also has class time. So, I have to leave my class for his classes; (2) I have to look after the family; (3) I use my brother's phone to continue my study and he encourages me to continue my study; (4) I live in combined family system. We have lot of guests—because of them I don't have time to give to my studies; (5) I can't find a separate room to take my class. Urban: (1) I have to do all the work and cooking, cleaning my family doesn't allow me to sit for a while and study; (2) As a female aspirant I sometimes face difficulty to take my class on time due to household work. Usually, my home environment is uncomfortable and disturbing; (3) Increased expectation regarding help in household chores; (4) Cannot study, sometimes internet connection problem, sometimes my household responsibilities.

Finally, the third question examines how the online learning environment impacted learner engagement and influenced learner agency. We suggest that as multiple structural and cultural perspectives intervolve, they have an impact on how learners engage with digital media to shape their agency. Our study found much evidence of a regional and

gender divide. Developing countries lack stable digital infrastructure, which inhibits internet connectivity and data usage. Moreover, gender-based societal norms and cultural beliefs get integrated into households. Additionally, as a consequence of cultural and technological structures, female students experienced less agency. Table 3 provides some exemplar quotes that highlight the positive and negative aspects of learner agency from both gender and region perspectives. While this study has been conducted using student participants, much of our findings would also apply to teachers who would have faced similar structural and cultural constraints that would have impacted their agency on teaching tasks.

Table 3. Learner agency: gendered and regional context.

Gender	Rural	Urban
Male	<p>Positive Agency Due to COVID-19, I am limited on my own hometown, but my goals have not changed, I tried my best to achieve my goals with online studies 😊. The sharing of computer screen is best experience everyone can focus personally as much he/she wants. We have learned about online platforms and ways to use them I can contact anyone from the class and the teacher. I can ask questions that I might hesitate in class.</p>	<p>Positive Agency Lecture recordings can also be accessed later, learning to use different digital tools, having access to Google search engine during classes. I'm connected with them 24/7 via MS teams and WhatsApp chat. We had a virtual community posting, where we were taken to different districts of the country, I thought that was pretty cool. I can learn easily from my living room, which gives me more comfort and attention. Due to chat box, I am able to ask questions, but in case of face-to-face lecture I was not able to ask due to lack of confidence</p>
	<p>Negative Agency Online is not good because students could not learn their lesson from professor as he can learn in university. Lack of in-person and peer interaction led to much suppression among us. Online class is tough to understand. We cannot explain ourselves or question teacher easily during online classes. I don't have books. Online learning is boring. Online classes in remote areas is baseless. Last semester I failed because of online classes. And this is the first incident when I have failed. Watching screen for long times makes me irritated.</p>	<p>Negative Agency Examination and evaluation methods are most often difficult and somewhat inappropriate. It isn't as interesting compared to physical classes. Teachers lack experience in using online tools effectively (e.g., lack of explanations, noise at teacher's homes). One of my teachers just reads out [from the book] and explain it to a very little bit which is very annoying. My phone hangs now because all day we spent taking online classes and I made tons of screenshots. Online learning is not useful for enhancing communication skills for teachers or for students.</p>
Female	<p>Positive Agency I make a plan of all the things I need to do for the day. We can interact with our teachers at any time when we face any problem during studies. Teachers become more friendly and caring. I prefer doing work on devices than making assignments on paper.</p>	<p>Positive Agency The studies are structured much better than I expected. We can join any class anywhere. Can ask questions more freely. Classes can be shifted to evenings or Sundays too. The break in between classes can be used for studying other things too. The positive experience is that you can save or download and even screenshot notes or topics the teacher are teaching so no fear of missing out on information. Learned lots of software knowledge.</p>

Table 3. Cont.

Gender	Rural	Urban
	<p>Negative Agency I didn't have a quiet environment to study at home. Most of time I cannot focus. Household responsibilities and the stress given by my parents that you waste your whole time on mobile etc., they call me up from the class to do any chore. Managing kitchen and books was really difficult. Timings of online class and my daily home responsibilities used to clash at all times. I faced some new problem daily. All this online learning for me was "Graduated! just somehow", without learning a bit about any topic. I cannot learn from my home. Online learning is totally absurd due to lack of practice. Difficulty managing my schedule at home.</p>	<p>Negative Agency I faced many problems related to some IT issues. When I saved my files, I faced many problems. Had no proper guidance. I felt lack of concentration and also my eyes and head hurts due to being more in front of the screen. It made our examination mode very easy, as nobody can fail in online assessment. Not interested to learn online because I can't understand properly because of soo many noises and sometimes Internet issues. Didn't get time to bond well with classmates. I hate online classes. Family keeps on interrupting me in between my classes.</p>

7. Conclusions and Study Limitations

COVID-19 has changed the world forever in many ways. It has emphasized the importance of having an inclusive and efficient digital strategy for learning and teaching such that learners are not disadvantaged by existing societal and institutional structures, or by cultural practices that do not provide learners with equal opportunities. This lack of digital strategy was highlighted by the inadequate measures taken by governments and institutions for maintaining the continuity of classroom activities during the sudden lockdown. Governments and educational institutions did not obtain the time to prepare themselves. This, in turn, helped expose the overall lack of adequate infrastructural and cultural support that further led to divides across multiple levels when it comes to ensuring equitable learning experiences are being met. A gendered and regional lens has revealed rich insights into pre-existing divides that impacted students situated in five developing countries. While many of these divisions overlap across rural and urban regions, a key message that emerged from our investigation was that of the digital gender divide. In having said this, we acknowledge that country-specific factors, such as economic development, geographical region, country history, and societal norms that influence the overall national cultural dimensions, have not been considered. While all five countries are deemed to be developing countries that are in one contiguous region, a further national-level cultural analysis would have added more granular-level insight into our findings. This limits the generalizability of our findings regarding the nature of learning divides to some extent.

A multi-layered investigation reveals that female students are limited in fully leveraging their agency while using digital technologies for learning and teaching activities. This calls for a deeper understanding of digital inclusion strategies by considering cultural circumstances surrounding online education deliveries and home environments. Student voices on existing divides have been laid bare in this study. We call upon policymakers to heed student voices when preparing a digital inclusion strategy for bridging current gendered and regional inequalities. While other studies mention existing divides in financial positions, socio-economic status, and overall general education delivery that surfaced during the COVID-19 crisis [13,19], this is the first study that provides student perspectives from the context of a developing country. Education policymakers need to invest in proper digital infrastructure at the grassroots level and set up educational agendas that resonate with equitable digital technology access and usage for their citizens. This implies investing in modern technologies and scaling internet access properly across rural and urban areas [15], in order to bring about digital and social inclusion. Uneven technology diffusion limits learning opportunities in terms of digital access and usage, which further inhibits

learner agency; therefore, strategies for balancing social and learning opportunities among students are crucial to allow them to fully participate in today's technology-driven societies. Further, socio-cultural norms need to be revisited by soft laws to reposition them for equitable educational transformation [40]. Government policies should be laid on the concept of social equality, that is, men and women be treated the same without any prejudice. While digital technologies can provide new opportunities to enhance student learning, the underlying societal attitudes toward gender-specific expectations need to be challenged [2]. This can be performed by establishing national digital policies that support women and promote a more gender-balanced environment within societies. Verger et al. [40] call for researchers to use different theoretical perspectives and methodological analyses to highlight current societal challenges at the regional scale in order to make an impact at the global scale. Our study is a step in that direction. It provides empirical evidence on the impact of unequal technology diffusion across rural and urban regions, highlighting the need for ongoing technological development. Further, the reality of existing gender disparities has been shared, which calls for the development of new social mediation policies and educational practices that encourage public dialogue for bridging the digital gender divide.

Finally, on a closing note, our findings align with four global missions that have been laid out in the United Nation's sustainable development goals (SDGs) report [41]. The SDGs report states that the pandemic is likely to reverse progress made by countries worldwide since the financial crisis. It calls on policymakers to "ensure inclusive and equitable quality education" (Goal 4), "achieve gender equality and empower all women and girls" (Goal 5), "reduce inequality within and among countries" (Goal 10), and "make human settlements inclusive, safe, resilient and sustainable" (Goal 11), among others. Our study contributes to raising awareness of existing digital divides by presenting empirical evidence from five countries. Enabling an inclusive digital learning environment at both the national and international level is essential for sustainable development and developing tomorrow's knowledge societies.

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