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Pandemic Pedagogy: The Digital Divide and Its Impact on Indian High School Students

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ABSTRACT

Excellence in education can be achieved when there is equity. Students who do not have access to adequate learning environment fall behind their peers who do. The digital divide in India is an economic and social reality that requires pertinent attention, which if not addressed, will lead to economic, social and gender inequalities in the long run. With the dynamic and technologically transforming domain of knowledge and digital integration, Information and Communication Technology (ICT) in India has evolved to revolutionise the educational sector in general and school education in particular (Bansal and Choudhary, 2024). Undeniably, the digital divide in this sector widened unprecedentedly amidst the COVID-19 pandemic and its consequent online education requirements (Blundell et al., 2020; Reddy et al., 2020). An effective remote learning process requires students to have necessary electronic gadgets and stable internet connectivity; which otherwise would lead to glaring disparities in quality education between the haves and have-nots (Kulal et al., 2024; Azevedo et al., 2020).

As such, the present study intends to explore the digital divide on the education sector in India in the context of Covid-19 pandemic. The study focuses on high school students in government and private sectors in urban and rural areas of Ludhiana, Punjab. Specifically, we examine the impact of access to internet connectivity and adequate gadgets on the educational outcomes, classroom participation and performance of students. We also analyse the relationship between access to technology and academic accomplishment among students. Lastly, we examine if the outlay by the authorities to tide over the challenges are effective. All necessary data are collected from the heads of schools and class-teachers across Ludhiana through a combination of questionnaire and interview methods. With better infrastructure, access to ICT and well-equipped teachers, the private school students are expected to be better off compared to their counterparts

1. INTRODUCTION

As the world is striving to come in terms with the ravages wrought by the global pandemic, a huge opportunity for improvement looms in the technology solutions adopted in the Indian education sector. To combat Covid-19, several stringent measures were implemented by governments across the world, which led to schools closing temporarily. Digital mode of education became the practice worldwide and the glaring divide became evident in the Indian scenario as well. This divide started showing its teething troubles as the world was forced to adopt digitization while nations locked down all the economic and social activities (Shankar et al., 2024).

India with the second-largest school system after China adopted e-learning techniques amidst a huge gap in digital equality. India's education system already trailing with an insufficient number of teachers, lack of access to schooling, and the digital divide, even more aggravated with shutting down schools to maintain social distancing (Awasthi et al., 2024). Although

Information and Communication Technology (ICT) is a catalyst for economic growth, India is now perturbed about the quick pace of Information Technology that is contributing to the gap between the country's urban and rural population (Digital India, 2014; INDIAai, 2020; Mathrani et al., 2021; Mythiri and Karthika, 2024).

In almost every society there is a section of people who have access to all kinds of technology and required knowledge and skills to operate it, and another section that does not have the expertise even if technology is available. Therefore, digital divide is defined as the gap between those who have access to the tools of ICT and those who do not (Lythreatis et al., 2022; Afzal et al., 2023). India is no exception to this as it lacks a robust digital infrastructure that connects students, teachers, parents, and institutions. Though one of the world's dynamic economies and a global IT power, it is still striving to minimize the digital divide. The education sector was at the receiving end of the lockdown due to the spread of Covid-19 and it is reported to have affected the quality of education badly (Bonal & González, 2020).

This issue turned out to be a huge challenge for the Indian education system, specifically the school education system which was already battling problems of quality and content difference among rural, urban and government versus private schools (The World Bank, 2021). It is a well-established fact that the quality and access to educational facilities in India especially at the secondary school level varies across different categories of schools (Kumar & Choudhury, 2020). Unlike urban India which has better digital infrastructure, students from rural areas will likely be affected the most because of the school closure and lack of technological resources to attend classes. A similar stark difference is observed among public-funded and private institutions in terms of access and quality of education (OECD, 2012; Kumar & Choudhury, 2020).

Given this background, this study explores the impact of digital divide on the learning outcomes among students of different categories of schools, by way of conducting a survey in the rural and urban schools both in the private and government sector. Though it is generally agreed that the public and rural educational institutions have inherent disadvantages, we examine how these categories performed under a scenario where all types of schools were forced to quickly adopt digital classrooms. We conducted a primary survey and our findings add evidence to the argument that both rural and government schools had to bear the brunt of school closures. We observe a glaring divide in the educational outcomes among the above- mentioned categories when compared to the private schools. Importantly, student performance has dropped considerably and access to quality online education remains a big concern. We also observe that the academic performance of females has reduced compared to males. Besides, we also report widespread dissatisfaction among the students on the way

classes are held online. Our findings are of importance to the policymakers and educators as it gives several interesting insights into how the students' performance has been impacted due to the quick transition from regular classrooms to online teaching.

The study is structured as follows: -

Section 2 presents a literature review on the impact of digital divide on education. Section 3 discusses the data and methodology followed by a presentation of the survey results in Section 4. The concluding remarks are made in Section 5.

2. LITERATURE REVIEW

It is often reported that the education sector is one of the worst affected due to digital divide across the world (Roshan, 2020). Specifically, students in less developed countries have fallen behind their peers in developed countries (Akpan et al., 2024). Home access to computers, as well as teachers' competence and support play a crucial role in learners' skills and use of ICT, thereby affecting the digital divide between schools. The learners who live in cities are better skilled and do well compared to other disadvantaged learners. Those learners who had the least access to tech-resources at home and the least support at school show fewer skills than learners from other schools (Konlan et al., 2025; Gudmundsdottir, Kulal et al., 2024; Matsieli and Mutula, 2024). Lack of income is another factor that impedes students' access because digital tools are relatively expensive (Zalaznick, 2020).

Several studies have pointed out that an enormous digital divide exists in school education in India (NSS, 2017-2018; Venkataswamy, 2015; Khan & Mohakud, 2020; Khanapurkar, et al., 2020). Although computer education was introduced over two decades ago in urban schools of India, most schools in rural and sub-urban India, especially the Government schools still do not have computers and lack teachers. Teachers are not trained in bridging the digital

divide and the students are not provided with the right IT tools, making the assessment of their performance on a regular basis difficult (Asadhullah and Bhattacharjee, 2022).

Infrastructural facilities also differ between rural and urban schools. A study by Sampath Kumar, et al., (2014) shows that a larger number of urban students (91.33%) use computers compared to very few rural students (32.33%). This is because 49.75% rural students lack the basic skills to use a computer, 48.27% do not have computers at school and 48.76% do not have adequate teachers. A common problem faced by both urban and rural students is electrical power failure (Sampath Kumar, et al., 2014).

Other studies also highlight the gender gap in digital technology adoption at the school level. The study by Joshi, et al., (2020) indicates that females are half as likely as males to own a mobile phone, to have access to the internet, or even know how to use digital technologies. This gender digital divide arises because of exclusion, poverty and inequality, and is likely to continue because of the effects of unemployment, poor digital skilling programmes and socio-cultural norms, and further depriving women of equal access to digital services (Barra et al., 2024; Chetty, et al., 2018). The number of earning members in a household also has an important bearing on access to technology (Gorski, 2005).

The notion that equity in education must be ensured to all the different sections of society became a real concern, despite the inclusion of ICT. Those who lack access to ICT especially facility of internet is more likely to be excluded from major channels of communication, thereby reducing the development of social capital and economic resources (Gyawali and Mehndroo, 2024; Hillier, 2018). More than half the households in the organized business class possess computer skills, independent of education level and income level. This is because it depends on their status, lifestyle and ability to finance their needs through borrowings (Tewathia, et al., 2020).

There exists a large gap in the resources available, quality of education and facilities offered by private and government schools. There must be coordination between private and government schools to share their resources so that the huge digital disparity existing between them is reduced (Sharma, et al., 2009).

Students who have been using the tools of ICT for a long time have done better academically compared to those who did not have the same opportunity. Empirical evidence suggests that introducing computers to children in schools can help them do better and reduce the huge digital difference between the haves and have-nots (Cheshmehzangi, 2023).

Another aspect of the digital way of learning is how the teachers perform. Teachers' attitudes and beliefs towards the use of ICT in Teaching and Learning in India showed that teachers were highly positive about the use of ICT, but the use of it in classrooms was inadequate (Kaur & Singh, 2018). Limited internet access, lack of modern infrastructure and technical support, need for training, rigid curriculum and traditional methods of evaluation have led to poor penetration of digital technologies in the Indian educational system.

More importantly, ICT-enabled education will help students and teachers bridge the digital gap and bring learners together in the pursuit of knowledge, encourage their curiosity to learn more and make the learning process more democratic (Konlan et al., 2025).

The prior literature supports the case for digital divide, which already exists and is often disadvantageous for the underprivileged in society. Global Development Commons (GDC, 2020) also conveys similar concerns. Countries that have low learning outcomes, high dropout rates, low resilience to shock and inadequate infrastructure, will face a more intense widening of the digital divide due to COVID-19. It is estimated that around 320 million learners in India have been adversely affected due to the shift to e-learning. Several

households without access to the necessary requirements are left out, creating long-term issues of inequality (GDC, UNICEF, 2020).

Schools all over the world have shut down due to the global pandemic and they have adopted various digital measures to continue schooling. They have done so at a time when the public budgets and household incomes have faced major contractions. It was found that globally, both the level of schooling and learning fell, causing a loss between 0.3 and 0.9 years of schooling (Azevedo, et al., 2020). It was estimated that 7 million students from primary till secondary education could drop out due to the income shock. Effective remote learning strategies are to be adopted, like radio, television, mobile phones, etc., with support to students, teachers, and parents (Clark & Gorski, 2002). Therefore, it is imperative to examine the impact of lockdown on school students in India, a country known for its digital divide.

3. DATA AND METHODOLOGY

We collected primary data from 320, class X students of 8 schools in Ludhiana, Punjab. Among them, 160 were from the rural areas, of which 40 each belong to 2 private schools (in Thrike Pind and Kamalpura) and 40 each belonged to 2 government schools (in Mangli Nichiand Sahnewal). 160 of the students were from the urban areas of which 40 each belonged to 2 private schools (in Mundian Kalan and Civil lines) and 40 each belonged to 2 government schools (in Sherpur Kalan and Basti Jodhewal).

Data was collected in the form of responses to 18 questions offered to students and 14 to teachers. A self-prepared questionnaire was offered to collect all necessary data. Teachers were interviewed to understand student performance, class participation and completion of homework.

The lockdown had restricted the movement of researchers. Hence a convenient location- Ludhiana was chosen. Within the rural and urban areas, the schools were chosen based on convenience and ease of access. The samples from each school were chosen using the simple random sampling method. After consulting school authorities, week 1- 6th February 2021 was fixed

for data collection. Students were briefed to answer the questionnaire. They were ensured of anonymity and names are withheld for this purpose. Questions were explained in both Hindi and Punjabi for clarity.

4. FINDINGS

The survey carried out by us had questions about family conditions, access to online education, digital infrastructure, student performance, etc., and each of them is discussed below.[2]

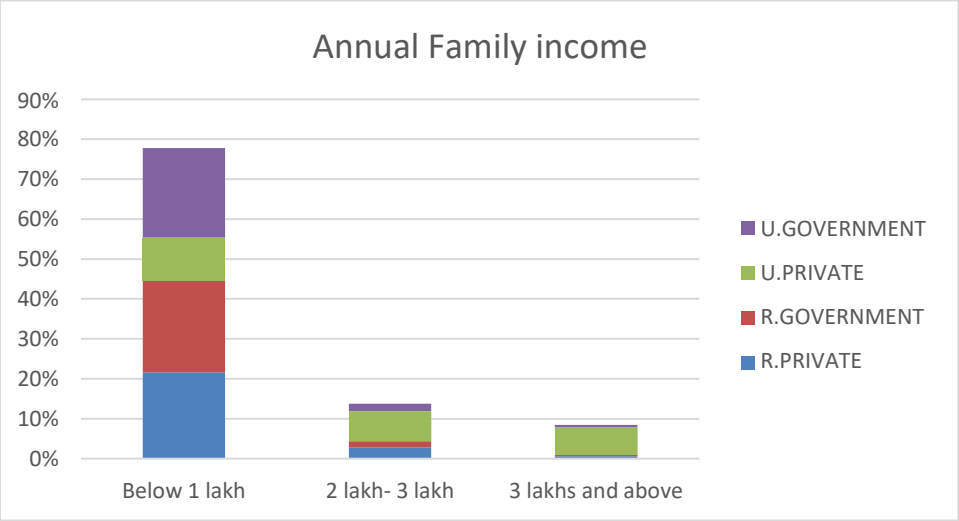
4.1 Employment of Parents and Annual Income

Most students who took part in the study belonged to the poor background. Fig.1 shows 77.81% families of the interviewed students have an annual income of below 1 lakh. The highest numbers being for those of rural government[3] school students. 18.75% families in urban areas have annual incomes within the range of 2-3 lakhs per annum only.

[2]The results shown here are from the survey conducted among students. A survey of teachers was also conducted, but it is not included here due to the word limit.

[3] U.Government = Urban Government, U.Private = Urban Private, R.Government = Rural Government, R.Private = Rural Private.

Fig.1. Annual family income (in lakhs)



Source: own survey

One of the major consequences of the lockdown was the loss of jobs and reduction of income that was reported across all sections of society. We investigated the job status and issues related to income among the parents. The data shows that 80% households faced job losses and 92.5% households faced salary deductions. Fig.2 shows that several students reported their parents losing their jobs due to pandemic. While the job loss was prevalent among mothers 63.44% (Panel A, Fig.2), fathers typically faced salary deductions 68.44% (Panel B, Fig.2). For a minority group of students, there has been no effect.

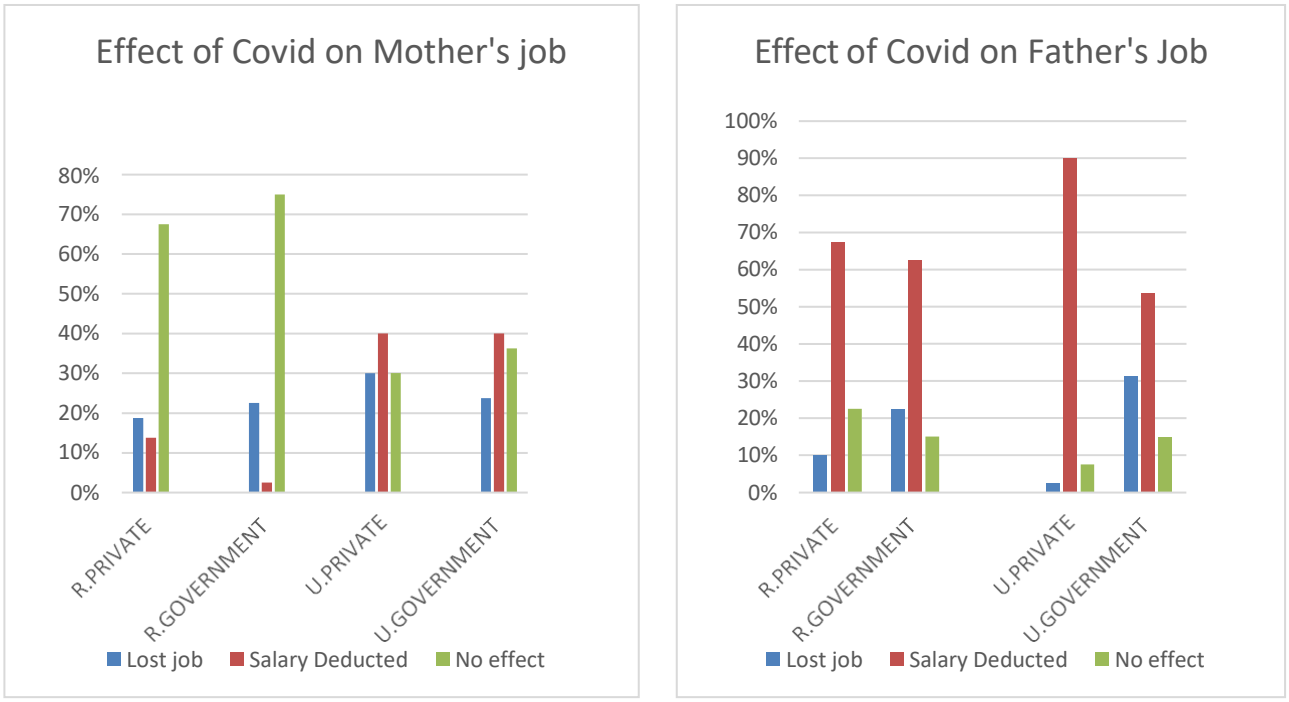


Figure 2: Effect of Covid-19 on Parental Job.

Panel A Panel B

Source: own survey

4.2 Online Platform Used and Requirements to Attend Online Classes.

In the next set of questions, we study the access to online medium of learning. We found that online classes were conducted through mediums other than *Zoom*, *Google Classroom* and *MS Teams*, such as *WhatsApp*, *Facebook messenger* and *Telegram*. Interestingly we also observed that a few urban and rural private schools have not used any online mediums to conduct classes. (see Fig. 3). The performance of government schools does not seem to be worse in this regard- sparkling hopes of bridging the digital divide.

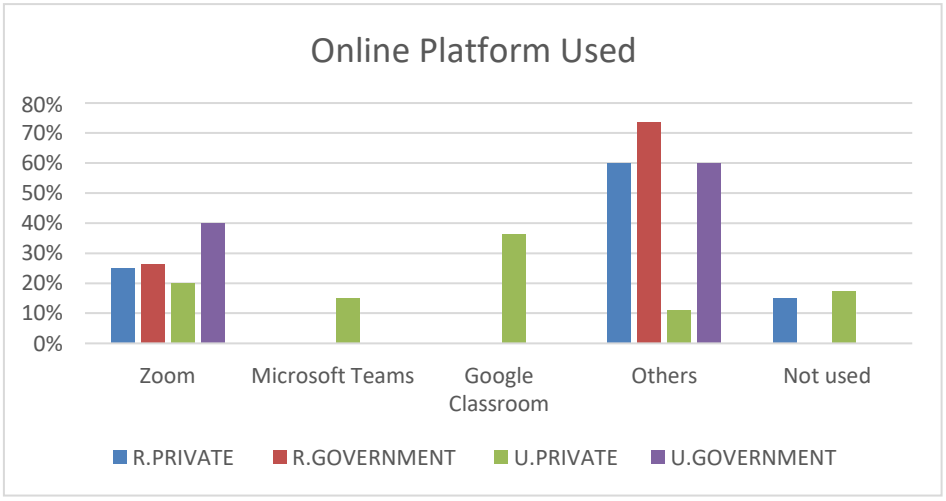


Fig.3. Online platform used.

Source: own survey

The study also investigates the volume of data available to each student. Fig. 4 shows

students' daily access was 1-1.5GB internet package. This suggests that the number of hours that could be spend on classroom activities are considerably less.

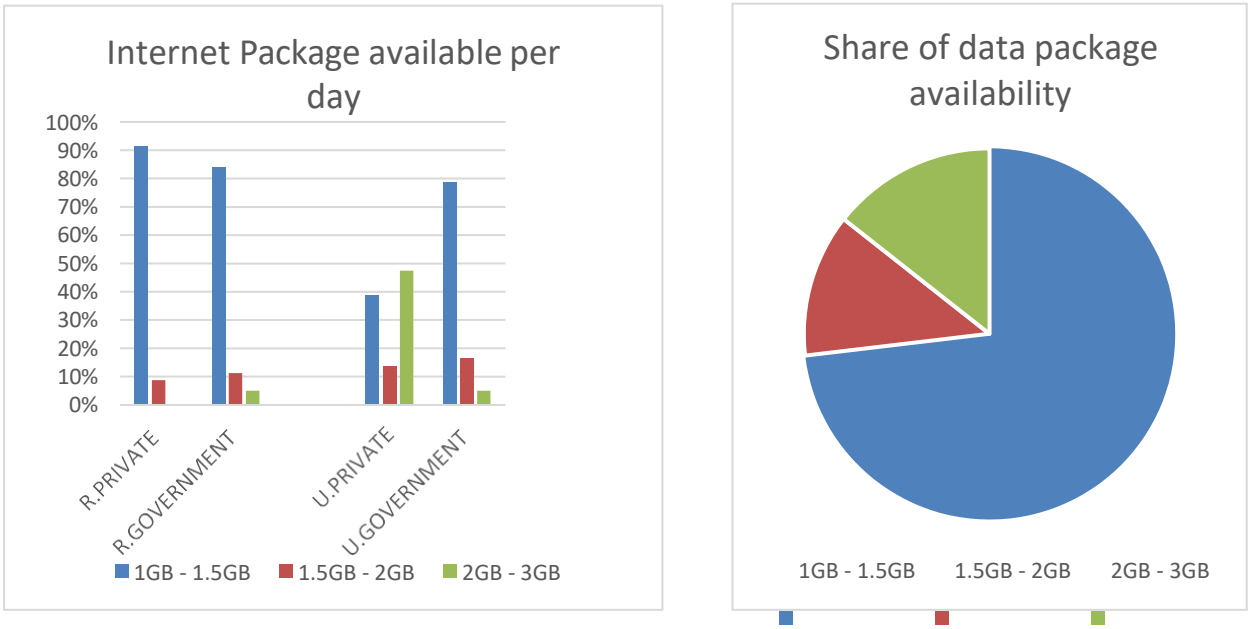


Fig.4. Daily internet package availability.

Panel A Panel B

Source: own survey

Quality of internet connectivity is another concern for online classes. Fig.5 observes that the coverage is mostly average for all students, rural and urban. Only 10.94% students face poor internet connectivity showing good scope for enhancing digital service delivery in the sector.

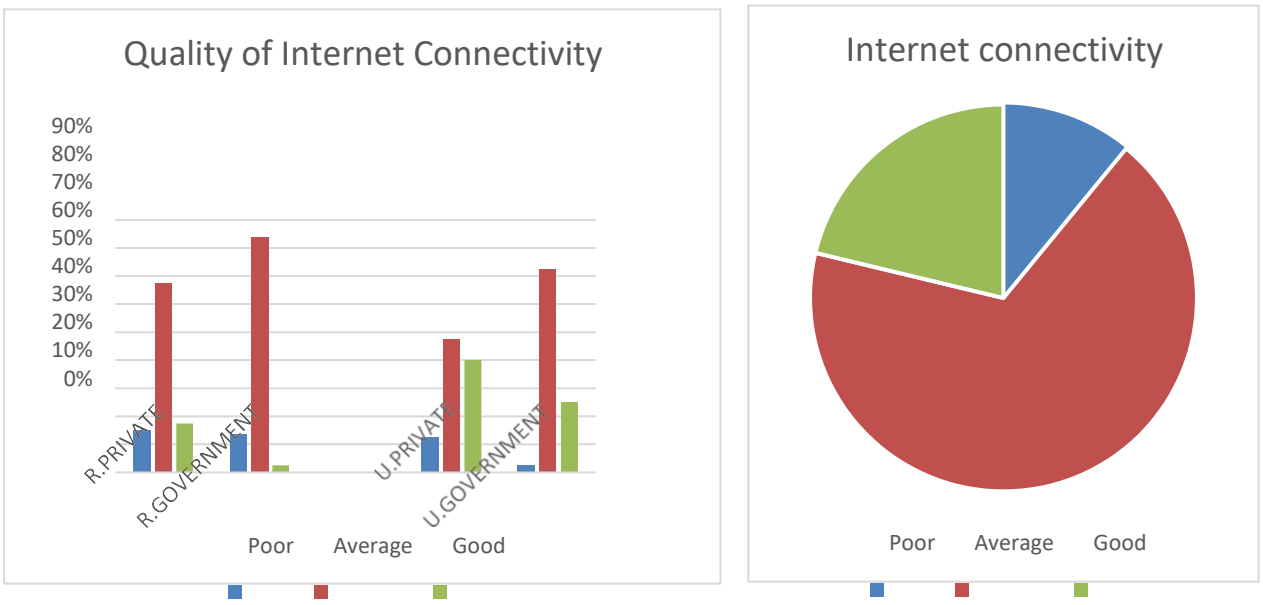


Fig.5. Quality of internet connectivity

Panel A Panel B

Source: own survey

4.3 Problems faced in Attending Online Classes.

Attending online classes also depends on the electricity availability[4]. Our survey finds that students from rural areas are at a clear disadvantage, facing more than 5 hours of electricity cuts. Students in urban areas face the same issue, but not as severe as that of students in rural areas (see Fig.6).

[4] Graphs on several problems faced by students are attached in the Appendix.

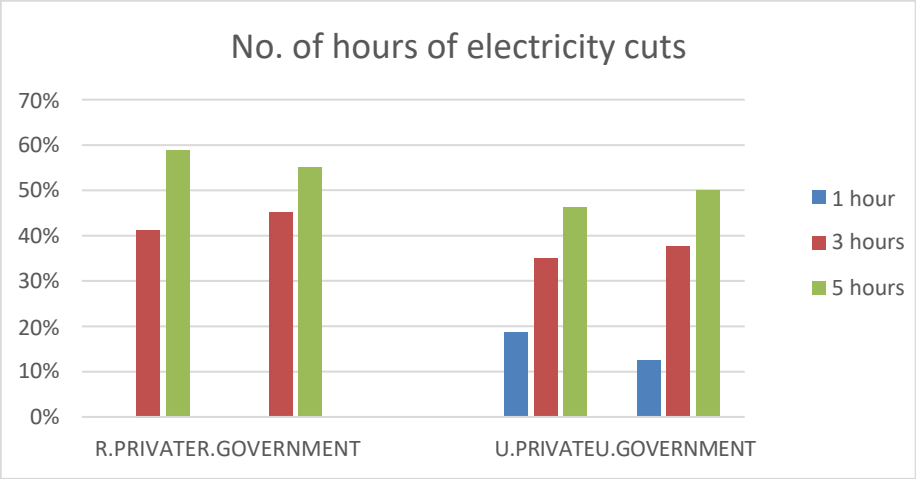


Fig.6. Hours of electricity cuts per day.

Source: own survey

Next, we study hours of usage of the device daily. Fig.7 shows 84.38% students can access their electronic gadgets for 2-3 hours. Students in urban school have access gadgets for 8-12 hours. This can be partially explained with the higher incomes associated with the urban population. Further, in several households limited devices which were used by multiple people.

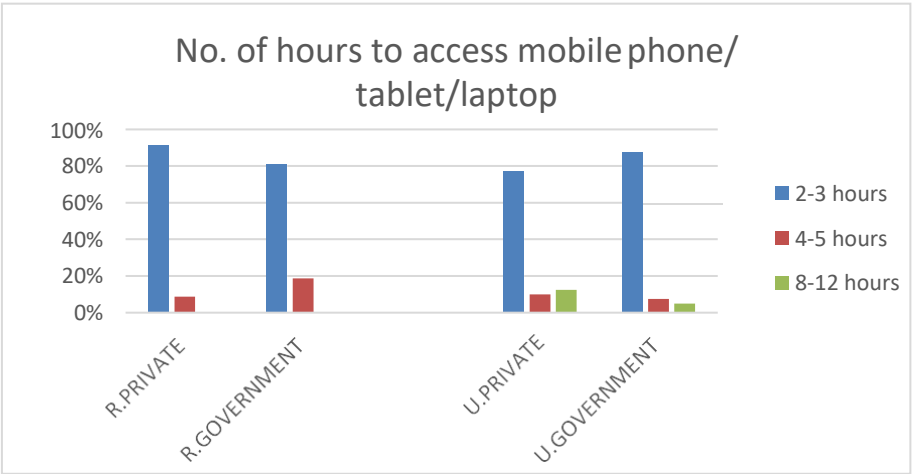
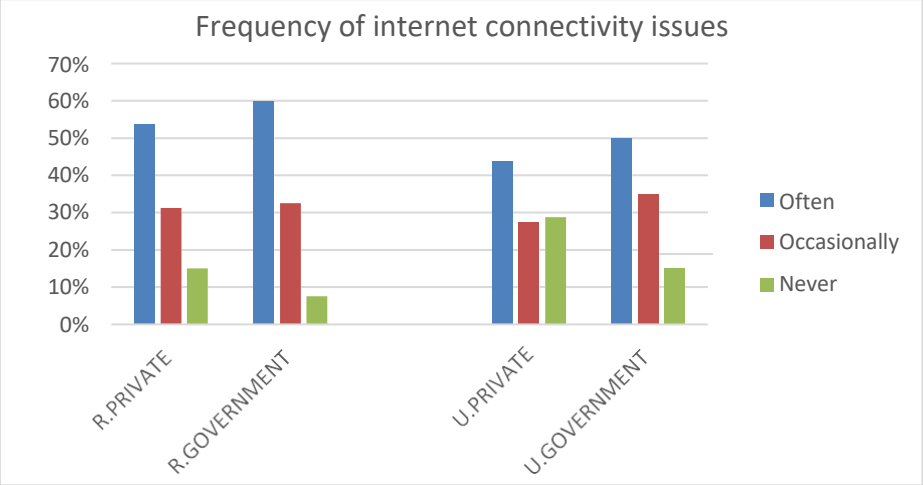


Fig.7. Hours of access to mobile phone/ tablet/ laptop.

Source: own survey

While around 55% in rural areas reported facing internet connectivity issues frequently, 45% urban schools face such issues very often. However, 29% of the students in urban private schools never faced connectivity issues. Students facing no issues in internet connectivity are 14% among urban government school, and around 9% among schools in rural areas. These numbers suggest that digital inequality is evident in rural areas and requires substantial attention.

Fig.8. Frequency of internet connectivity issues



Source: own survey

4.4 Grades of Students

In this section we explore the performance of the students. Fig. 9 shows 60.63% of students' grades have decreased in the current year (2020-2021) compared to the previous year (2019- 2020). This is a silent but significant impact of the situation

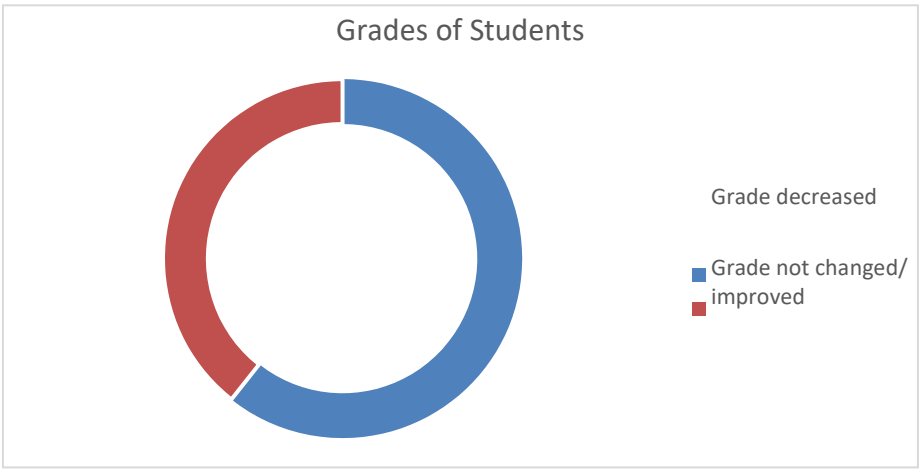


Fig.9 Student grades

Source: own survey

Interestingly we observe that there has been no change in the marks scored by males, but the marks of females have dipped by 21.25%. This result is not surprising as there are studies that already suggest that gender differentials exist in secondary education in India as girls are expected to take up domestic chores (Singh & Mukherjee, 2018). Therefore, COVID-19 has had an impact on educational access to girls, which needs a thorough investigation.

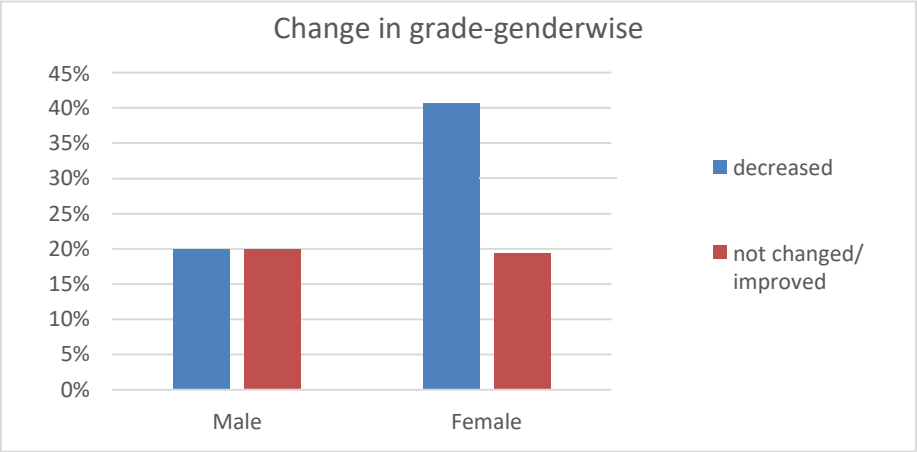


Fig.10. Gender-wise grade variation

Source: own survey

4.5 Student's Class Participation

Fig.11. shows that several students in both rural and urban areas submitted online assignments. Students of urban areas are on an average more regular in submitting them (68.5) compared to students in rural areas (56).

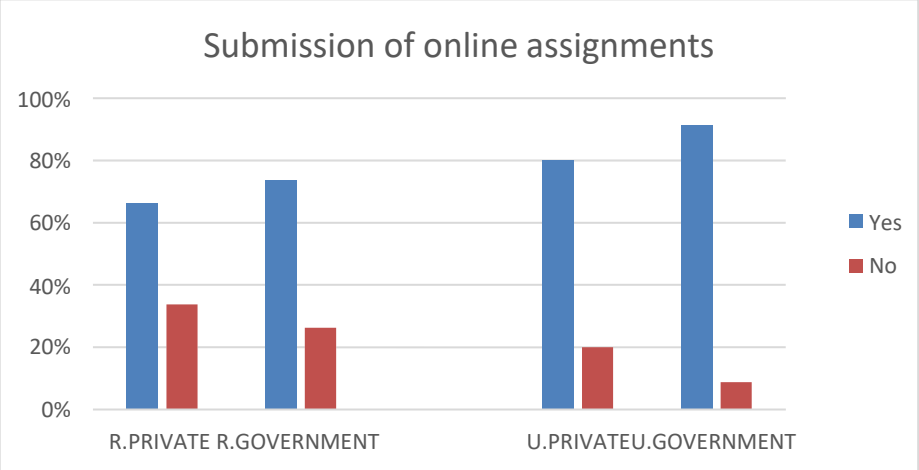
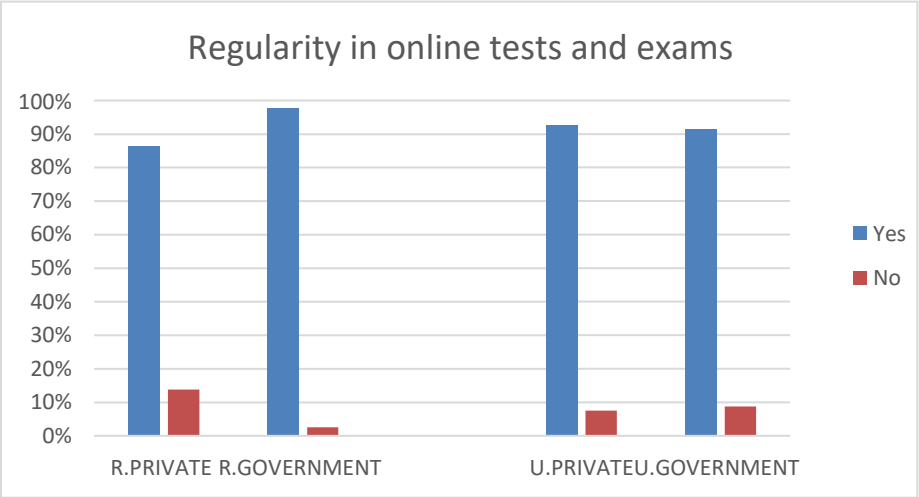


Fig.11.Submission of online assignments

Source: own survey

Further, students try to be regular in attending their online tests and examinations despite the connectivity issues. This is not an issue for students of both rural and urban areas (see Fig.12).

Fig.12. Regularity in online tests and exams.



Source: own survey

4.6 Satisfaction of Students with Transition to Online Mediums of Learning

We also try to evaluate the student's perception of online classes by asking them diretly about the level of satisfaction. Overall, the students of both rural and urban areas were satisfied with the course before moving online[5] (see Fig.13).

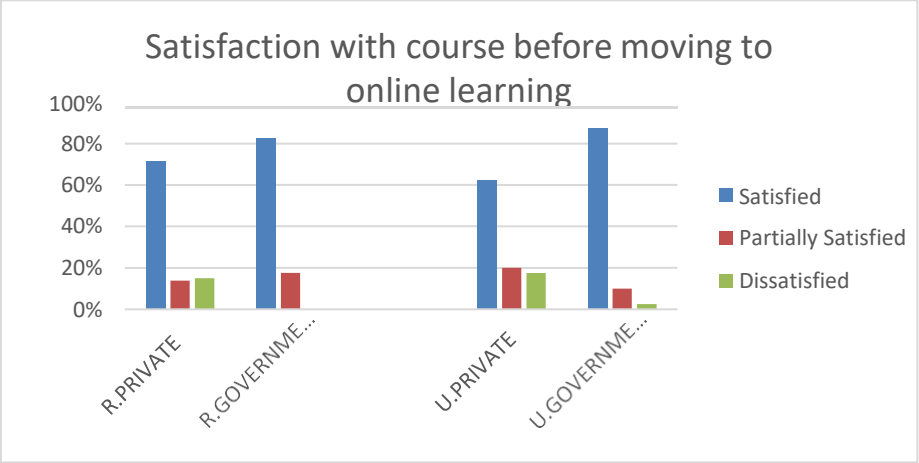


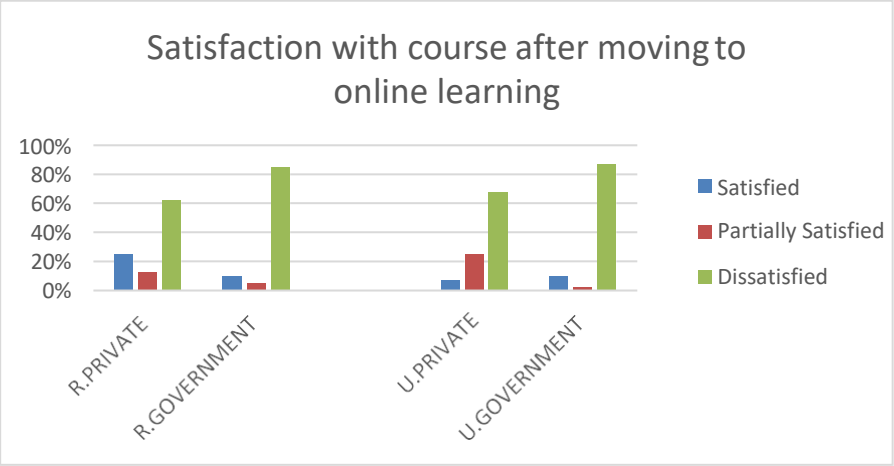
Fig.13. Satisfaction with course before moving online.

Source: own survey

[5]We are aware that the result could be skewed in favour of offline classes, considering the challenges faced by the students. However, this question helps to know how valuable the offline classes are.

However, post lockdown, we see a stark difference in the satisfaction reported by the students. Fig.14. shows a clear change in student satisfaction after moving to online learning. Overall, 75.63% students are dissatisfied. On the whole, students are dissatisfied with the transition to online learning. Only a small cohort appear to be satisfied with the transition. This is a matter of grave concern for students, teachers as well as policymakers. The students themselves realize that the online way of studying is not as effective as offline classes.

Fig.14. Satisfaction with course after moving online.



Source: own survey

We also find that 90.94% students are mostly happy with their course instructor's preparation. This is not an issue for students of both rural and urban areas (see Fig.15).

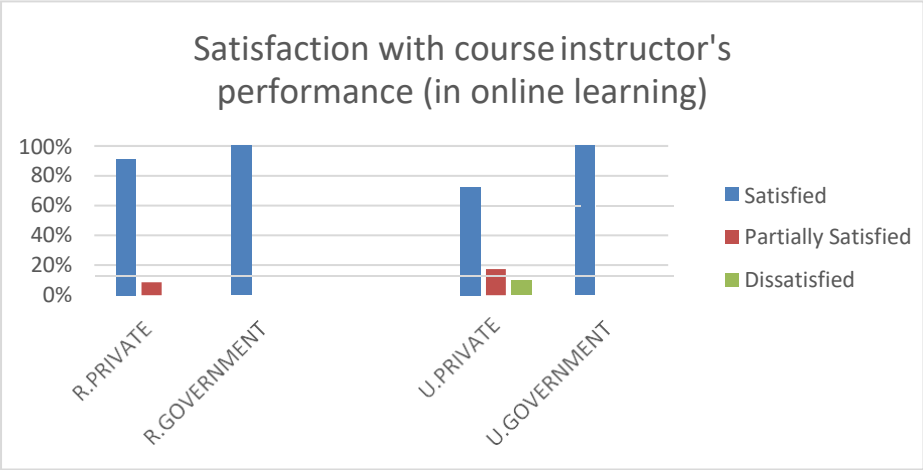


Fig.15. Satisfaction with instructor's teaching

Source: own survey

Overall, our findings show that the performance of students has reduced due to the online mode of education. The digital divide in accessing classes is an important factor contributing to this. There is widespread dissatisfaction among the students about the way the classes are progressing online, which we believe is a serious issue that needs a holistic approach to solve.

5. INTERESTING OBSERVATIONS DURING SURVEY

Poor parents were forced to send their children for work to cobble together two meals a day. Some students worked during the pandemic to support their schooling and families. A few boys worked part-time at a local food factory where they baked bread, and girls learnt embroidery, from which they now earn money as a part-time job.

All the students studied in this paper belong to the age group of 14–16 years. Few students earned money from working in construction sites and selling goods on the streets. One student had to find work during the pandemic being the eldest child and to support the other 4 siblings.

Several students going to government schools in rural areas were suffering from poverty and their whole family lived in single rooms, making it difficult for them to afford or even attend online classes. Students also worked in dairies, general stores and puncture repair shops.

6. CONCLUSION

In Ludhiana schools, the daily routine of the teaching-learning process underwent great challenges and transformation. While the government prioritised health over the economy, the weaker sections of the society became the worst affected, including many of the school- going students. The pandemic came without any warning, leaving no time for action, yet the schools managed to train their teachers to take online classes, but the same could not be done for students.

The study showed that many students were not up to the standard of receiving 'online education' due to impediments like poor internet, unavailability of gadgets and long hours of power cuts. Punjab government had gifted smartphones to class XII students, which they should have extended to classes VIII- X as well, to address this issue. Arranging to distribute printed material or solution guides can compensate for the loss of blackboard learning.

This study has found that students were dissatisfied with the move to online learning. Since many parents lost jobs and faced salary deductions, it was difficult to afford expensive digital requirements, like buying necessary gadgets, ensuring internet connectivity, etc. Students also faced average quality internet connectivity, with access to only 1GB-1.5GB data per day and electricity cuts for as long as 5 hours per day. Despite all these odds, they managed to submit their assignments and attempt online tests and exams. We also found a notable fall in marks scored by students, especially girls, after the transition to online learning. This is a matter of grave concern. One of the biggest issues we believe is coming from the widespread

dissatisfaction and deteriorating performance reported by the students. Parents, teachers and policymakers need to come up with a framework to address this.

The measures which the government adopted like screening live classes on DD Punjabi, recreational activities like yoga, art classes, moral education, etc., to keep students motivated should continue. Innovative teaching-learning techniques must be adopted, like diagnostic assessments, encouraging students to be proactive, provide study material in several formats (audio, video, e-books and e-readings), etc. Punjab Government's initiative to educate school children through animation videos during the pandemic - *'Mission Fateh'* is quite commendable. The high school education system must focus on strengthening the engagement between schools and parents to understand the difficulties of students. Guiding parents on good practices that will improve the students' learning is necessary. Accessibility and inclusion from the technological perspective can be possible with the active role and involvement of community institutions as well.

With the national average at 2.97% and Punjab between 2.98% - 3.13% children out of school[6], every next level of unprecedented challenges demands bridging the digital divide. It is necessary to equip teachers with digital skills and employ innovative techniques to ensure access to all students irrespective of the type of school (government or private) and location of school (rural or urban).

The authors feel that the bottom layers of the pyramid in high school education should be uplifted to desired levels. The pandemic taught the world the best lessons in the worst times. The country should strive to bridge the digital divide and leap towards a vibrant tomorrow. Therefore, minimising the digital divide and ensuring access to quality education for all,

[6]https://www.education.gov.in/sites/upload_files/mhrd/files/upload_document/National-Survey-Estimation-School-Children-Draft-Report.pdf

particularly the poor and rural population is crucial for the economic and social development of India.

7. LIMITATONS

This study is fraught with limitations. Firstly, we were forced to restrict our sample to places in and around Ludhiana, Punjab due to the restrictions in movement. Secondly, the researchers could not do a pilot survey once again due to the restrictions imposed due to COVID-19 and we chose to go for the survey directly. The study would have been more impactful if a pilot study was carried out. Further, this would have helped us to frame our questions in a better conceptual framework. Specifically, this would have helped us in carrying out the regression exercise. We intend to address these issues in the next phase of the study.

FUTURE RESEARCH

Future researchers can look into several aspects of the impact of lockdown on the education sector. Specifically, they could examine the gender disparity in access to online education. The role of educational institutions in supporting students as well as teachers is also an interesting area to investigate.

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