Digital Infrastructure – The Need to Overcome Digital Divide and Inequality in Higher Education

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Abstract

Coronavirus affected millions of people worldwide. India was no exception with huge loss of lives. Life was not normal for everyone. The absence of requisite learning skills in around 825 million children and gaps in access to education were further highlighted by pandemic (World Economic Forum, 2021). When Covid hit, academics had no clue of how to manage education. While educational institutions in Chennai were getting ready for online education, this qualitative study was undertaken to identify the availability of Digital Infrastructure among students for Education. Purposive sampling method was adopted for the study. A survey questionnaire was used for data collection from students online and 681 samples were collected for the study. Data analysis on the availability of infrastructure with the students for online academics revealed that the majority of the students (60) reported that they used smart phones for online education. More than half of the students (51%) had only average and poor broadband or internet connectivity. Nearly fifty percent of the students (48.9%) reported to have affordability for only 1 GB internet data per day. Findings revealed the digital divide and inequality in higher education.

Keywords: Covid, digital infrastructure, digital divide in education, social work, advocacy, sustainable development

1. Background of the Study

Covid-19 Outbreak

The first case of Covid-19 was identified in Wuhan, China on December 2019 (WHO, 2020). The first case of Covid -19 in India was reported in Kerala by the ministry of Health and Family welfare on 30th Jan 2020 and the patient was a student in the Wuhan University in China (Reid, 2020). The first case of Covid-19 in Tamil Nadu was reported on 7th of March. The patient was a 45-year-old an engineer from Kancheepuram and he was later tested negative and was discharged (Coronavirus update, 2024). Life drastically changed for everyone in the state with spread of Covid-19 and every aspect of life was affected. The education sector was no exception.

There were nearly one million Indian students studying in US universities. The US Immigration and Customs Enforcement announced that international students pursuing degrees in universities might have to leave the country or risk deportation if their universities fully moved on to offering education online (CNN, n. d, 2020). The above statement clearly reflects the uncertainties prevailing globally about higher education during Covid.

The higher education institutes were shut down from 16th march 2020 in India ("Government Announces Closure of All Establishments across India till March 3st", 2020). Prime Minister of India in his address to the nation announced a lockdown extended to the entire nation for 21 days (Hebbar, 2020). The human resource minister Mr. Ramesh Pokriwal announced that academicians were also corona warriors as they were making sure the students were secure, motivating and educating them (Indian Express. 2020, May 28). He further stated that communicating with students every day required stupendous effort and that academicians had done a good job. University Grant Commission (UGC) had announced on 24th April 2020 the appointment of two committees to look into the issues faced by the academic institutions in teaching -learning processes, examinations, admissions and other related issues in view of the Covid-19

pandemic and country wide lockdown and to suggest appropriate measures to avoid academics loss for the future students (India Today. 2020, April 30). Based on the deliberations UGC announced revised guidelines for examinations and academic calendar (UGC Guidelines on Examination and Academic Calendar for the Universities in View of Covid-19and Subsequent Lockdown, n.d).

World Economic Forum (2023) reported that some believed that the unplanned and sudden move to online learning without proper training, insufficient bandwidth and little preparation would result in poor user experience while others believed that it would bring in a significant benefit. Sustainable Development Goals (SDGs) focus on leaving no one behind. Higher education plays a crucial role in the country's growth and development by producing high end skills for industries' innovations and economic development. It was in this background the study was undertaken to explore the availability of digital infrastructure among students in Chennai for accessing higher education during the pandemic.

2. Literature Review

The sustainable development Index by NITI (National Institution for Transforming India) Aayog (2024) displayed the progress of country and the states on the 17 goals. Under the SDG No.4, the data showed that only a few states such as Kerala and Uttrakhand had made positive progress towards Quality education: Kerala from 74 points in 2019 to 80 points in 2020 and Uttrakhand from 66 points in 2019 to 70 points in 2020. Many other states indicated a marginal or significant decrease in their progression towards achieving quality education. The reason for the setback was Covid 19 which disrupted the formal education in many ways. World Economic Forum (2024) highlighted that 320 million leaners were adversely affected during Covid in India. With huge regional and household disparities in accessing the internet and technology, the transition in education from physical classroom learning to online mode was not possible for all the students and educators. This has led to inequality and deepening of the digital divide in education.

The root cause of vulnerability is related to political ideologies, economic systems and limited access to power, structure and resources (Blaikie, et.al., 1994). Lack of digital infrastructure would limit the students' access to higher education, resulting in lack of knowledge and skills development.

Sustainable Digital Infrastructure Alliance (2024) defined digital infrastructure as 'the total physical and software-based infrastructure necessary to deliver digital goods, products and services. This includes data centers, fiber infrastructure, server hardware, personnel, IT virtualization and infrastructure software, operating systems, etc.'.

West L.J (2011) defined digital divide as "simplistic phrase used to explain the gap between people who can easily use and access technology and those who cannot. The term digital divide has been in common use to refer to the sense of technological haves and have-nots for over a decade"

Internet Penetration in India is at 48.7% (Statista, 2023) as against 99% populations in Saudi Arabia, United Arab Emirates and Norway. Muller et all., (2021) highlighted in their study that social class was a strong predictor of digital disparities, including the quality of hardware, software and internet access. It was reported the school closures during Covid exacerbated academic inequalities. The digital divide, i.e., unequal access to digital resources, unequal digital skills and unequal use of digital tools, resulted in some people more likely to be excluded in digital education.

Alliance for Affordable Internet (2021) stated that the digital exclusion was no longer about the reach of the infrastructure that made the internet access possible. Affordability, social norms, security and privacy were all part of the system that kept the billions offline. Cullinan, J. et.al (2021) reported from their study conducted among the Irish Higher Educational Institutes that one-in -six students came from areas with poor broad-band coverage and concluded that students from poorest broadband coverage were also more likely to be socioeconomically disadvantaged.

Mobile phones have features which can contribute to creating new learning styles, and methods and devices could be used as collaborative, contextual and constructionist forms of learning (Pattern et al., 2006). The study revealed that majority of the respondents (70%) had Smartphones for attending online classes. Subjects that had practical orientation and applications were the most difficult to be translated to education in an online platform. American Academy of Ophthalmology reported that staring at the screen for longtime could cause discomfort to the eyes. People experienced eye strain and the symptoms included dry eyes, blurry vision, tearing or watery eyes and headache (Porter, 2019). Fan, Q. et al (2021) reported from their study that devices with small screen sizes such as smartphones or iPads which were used for digital learning displayed crowded fonts and reduced row spacing. It also offered limited display brightness which required the need for more eye adjustment and radial movement. Prolonged hours of learning with such devices could cause visual fatigue. If visual fatigue was not relieved promptly, it could further progress into myopia. The symptoms of myopia included distance vision fluctuations and squinting when gazing at distant objects. It was also observed that higher incidence of myopia observed during Covid pandemic than before (Kozeis, 2009).

Scanders, C. K and Scanlon, E (2021) highlighted that United Nations had declared that access to internet as basic human right. The human rights that people have offline must also be protected online (UN- Human Rights Counsil, 2016). Social

Work profession closely works with sustainable development goals. Even before the SDG were developed social workers were working for the promotion of human rights. To overcome the digital divide and inequality in education, social workers must undertake research studies on the digital divide and inequality and use the social work method of advocacy to promote digital inclusion.

3. Methodology

The Governments, central and states had ordered lockdowns to restrict the spread of Covid. Hence, educational intuitions were shut down. Since it was an unprecedented situation for educational institutions and their various stakeholders, the study was intended to identify the existing Digital Infrastructure for online education among students and explored the possibilities of offering education via the online mode. The higher educational institution for the study was identified based on the access to the researcher, feasibility of the study and availability of respondents for the study. Non probability sampling method of purposive sampling was adopted for the study due to the extraordinary situation prevailing in the society that restricted movement and physical contact. A Semi structured interview questionnaire was circulated to the students via online for data collection. The total sample collected was 681. Frequency distribution analysis was done with the quantitative data.

In-depth interviews were conducted with 40 students for additional information on the following Pre-Codes based on the theory of Digital Infrastructure which is "the total physical and software-based infrastructure necessary to deliver digital goods, products and services" (Sdalliance.org, n. d). For the purpose of this study, a product or service was defined as educational:

- Gadgets owned
- Gadgets planned to use for online education
- Technical issues faced or Expected with the Gadgets or Internet.
- Internet Access and Quality
- Internet Data respondents could afford

Qualitative data was coded into organizational categories to maintain the alignment with the research questions. Deductive analysis for identifying theme and pattens was carried out. Explorative research design was used for the study as covid 19 was an extraordinary phenomenon experienced by society and in particular academics.

4. Results

The data collected were analyzed with Frequency. Frequency analysis is part of descriptive statistics. The statistics deals with number of occurrences, central tendency, dispersion and percentile. The Qualitative data were coded and the patterns or themes were identified.

Demographic Details of Students

Majority of the respondents in the study (70%) were female and close to one third (30%) of the student population was male. The representation of post graduate students was higher in the study (66.5%) as compared to Under Graduation (33.8%).
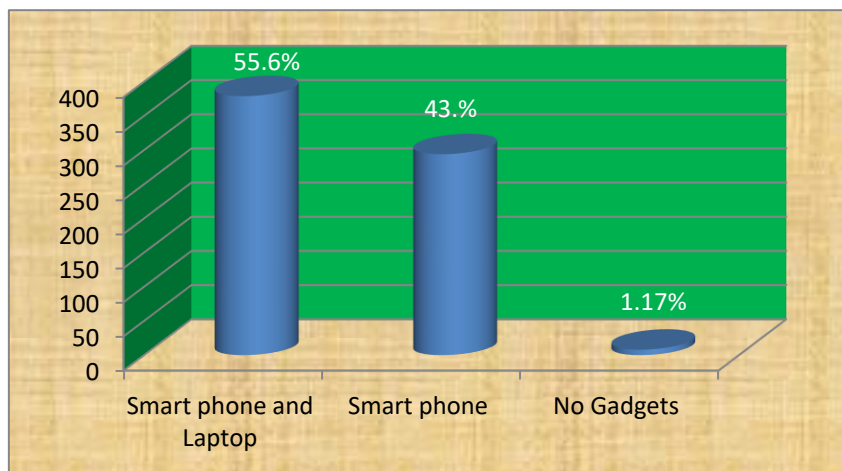

Figure 1. Gadgets Students Owned

The data from above Figure 1, indicates that more than half of the students (55.6%) owned smart phones and laptops and

a little more than two fifth of the students owned smart phones alone (43%). There were students (1.1%) who did not own any smart phone or gadgets to attend online classes. This could affect their education.

Gadgets - Students Would Be Using for Online Classes

The regular academic activities came to a standstill from March 2020 until the 2021 -2022 academic year. The Universities and the colleges in India had started using online modes such as Zoom, Google Meet, WhatsApp video etc. to complete the pending academic requirements for the year. School results were announced, and students were promoted without examinations. The private schools in the state of Tamilnadu went ahead with the academic year (2020 -2021) related activities online even as a case was filed against online education in Madras High Court. The court had suggested the government to get experts committee on the effects of online class on students' health and provide guidelines for online education to the schools.
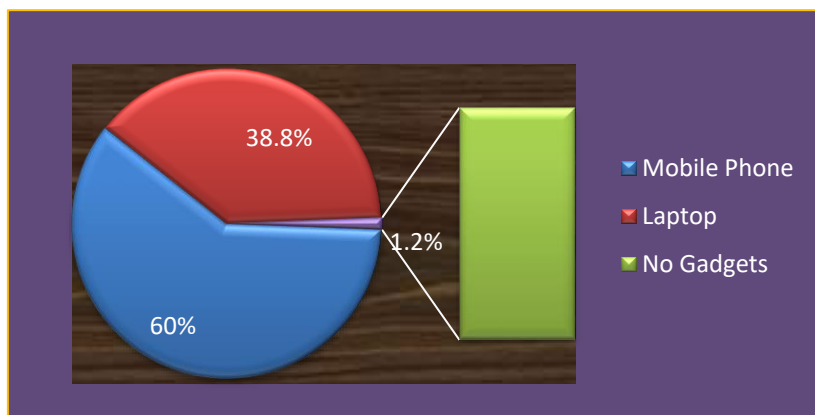

Figure 2. Gadgets Students would be using for Online Class

The data analysis of the study from Figure 2, pointed out that the majority of the students (60%) were using mobile phones for attending classes. Nearly two fifth of the students (38.8) were using laptops. There were students (1.2%) who did not own any gadgets suitable for attending online class.

One of the students had expressed his opinion on using gadgets as follows.

"Three of my siblings have online classes at different times from morning till evening. Since we are all using the same gadgets, it is difficult to attend the classes online if our class timings collide"

Majority of the students reported using mobile phones which had small screens compared to the physical class rooms with larger screens or boards. It could adversely affect the students' concentration, cause strain to the eyes and neck and lead to other physical complications and psychological effects.

Technical issues with Gadgets during online classes.

Students experienced technical issues with gadgets, but repairing gadgets wasn't immediately possible due to lockdowns. As such, it would again affect the education of those students' experiencing issues with gadgets. A student expressed the technical difficulty experienced as follows.

"I own the best smartphone in this household(relative's); unfortunately, my phone screen was broken last year end in the college campus itself. Thankfully the touch has no problem but all that I view will be through the cracks. It definitely has an impact on my eyes".

Availability of Broadband or Internet Connectivity in Students Locality

Internet is the essential key to online learning. The internet connectivity has improved in India in recent times especially after the entry of Reliance -Jio into telecom industry. But still the quality of connectivity remained as a concern during the lockdown in rural parts of India. The connectivity was also lost sometimes within certain rooms in the house.
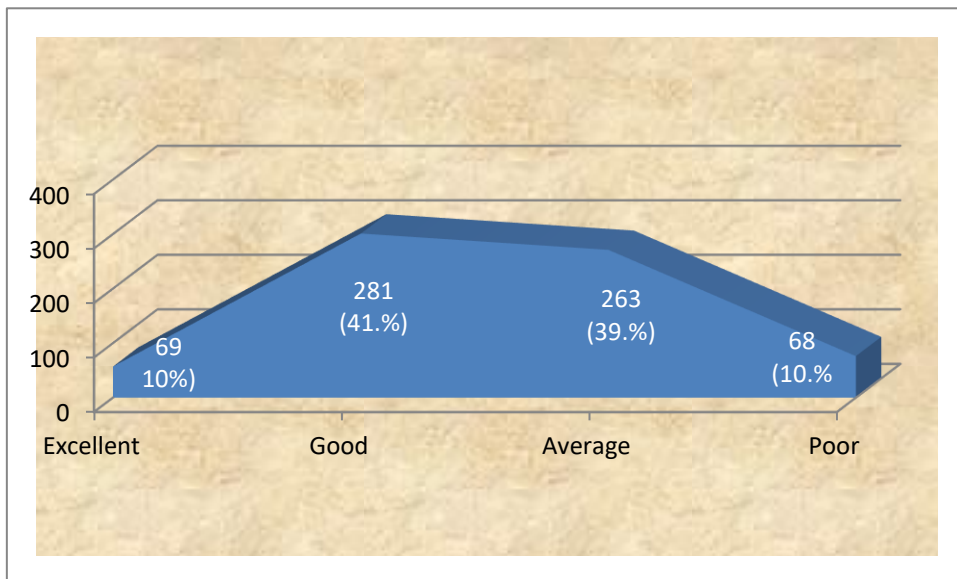
Figure 3. Broadband or Internet Connectivity Students Had

It is evident from Figure 3, that less than one tenth of the students had an excellent internet connection (10%) and nearly one fourth of the student's had good connectivity (41%). When both of the above data were added together, it was observed that a little more than half of the students (51.6%) had had a good to an excellent Internet Network connection. They were in a good position as far as internet connectivity for the online classes was concerned. The remaining students had average internet connectivity (39%) and poor connectivity (10.2%). It meant that nearly half of the students were at risk with internet connectivity which could disrupt the flow of education.

The below statement by a student summarized the internet and gadget problems faced by the students.

"Internet connectivity is one of the major problems. Having only 1 smart phone I have to share it with my sister who is also studying, and I have only a small chance of attending all the classes registered"

The below statement by a student indicated the advantageous position for online education with the availability of digital infrastructure.

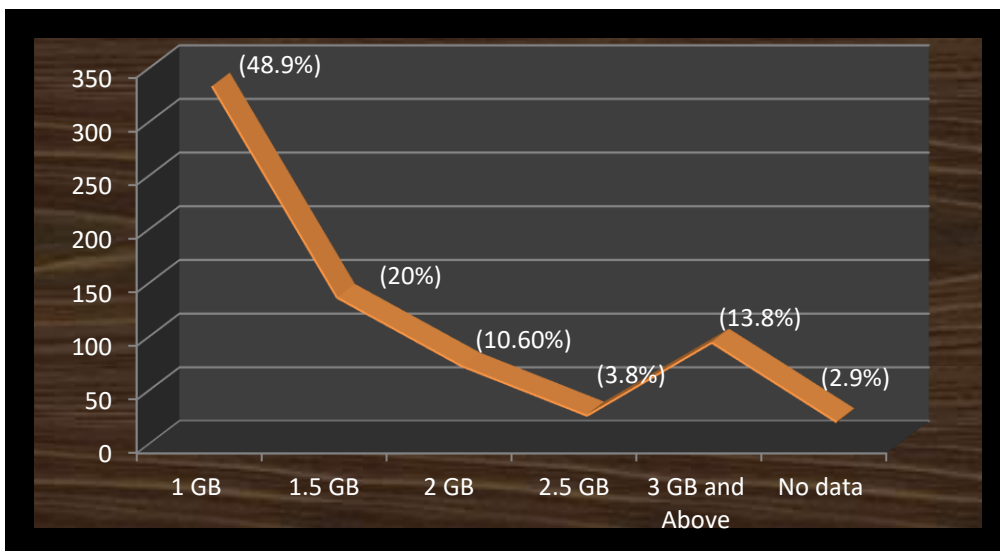*"I don't have challenges attending online classes".*

Figure 4. Internet Data Student Can Afford Per Day

The above Figure 4 points out that nearly half of the students (48.9%) reported that they could afford 1 GB data. Almost the other half of the students with 1.5 GB (20%), 2 GB (10.60%), 2.5 GB (3.8%) and above 3 GB (13.8%) data were found to be able to afford higher packages of internet data which would help them to continue the online education without

disruptions of internet service. There were also students who could not afford any internet data (2.9%).

The above quantitative data and below qualitative data indicated the position of those respondents with limited and no internet data indicating the possible disruptions or exclusions in the digital education.

Student 1: *'Unable to attend more than 1 class per day due to data restrictions.*

Student 2: *'I can't afford the internet data due to low income'.*

Student 3: *'Insufficient data plan'.*

5. Discussion

World Inequality Report (2022) highlighted that when India allowed private sector led growth, it had not concerned itself with or checked the rising inequalities in India. As a result, India stands as one of the most unequal countries in the world today. World Economic Forum (2016) stated that in India, the richest 1% own 53 percent of country's wealth and the top 10% own 76.3% of the nation's wealth. This is despite the fact that India is currently one of the fastest growing economies and is the 5th largest economy in the world (Forbes, 2024).

The findings from the data analysis showed that nearly half of the respondents reported to have 1GB internet data which would not be sufficient to attend all the classes. In terms of internet connectivity or the quality of internet, half of the respondents reported access to average or poor internet. This was further validated by a respondent in a qualitative in-depth interview "*I can't afford internet data due to low income'.* Another student expressed, *"Internet connectivity is one of the major problems".* Unless the concerns of these students are addressed, they would be left behind by the online education system.

The enrollment in the higher education of India is getting attention currently with Governments offering welfares and incentives for students, particularly for girls. The state government of Tamilnadu promotes higher education among the students. It also has a special scheme titled 'Puthumai Penn' (modern and educated women) for girl students from government run schools. Under the scheme Rs.1000/- is directly transferred into the bank account of the students every month until they complete the under graduation or diploma or ITI -Industrial Training Institute (Puthumai Penn, 2024). Tamilnadu has seen significant progress in the enrollment of students for higher education. According to AISHE report 2020-21 the enrollment in higher education has increased to 4.14 crores and female enrollment to 2 crores. More such measures need to be taken to address the digital divide in education. As future pandemics cannot be ruled out, the educational systems and the governments must take necessary measures to prevent fallout in education. School Social Workers, Community Social Workers and Social Workers working with children and in the field of promoting quality and inclusive education can identify those students who may have challenges with infrastructure for online education and network with agencies that could render possible services. Higher Education is related to learning to enter professions, placement and career development. Hence, special care and attention should be given to students who have been left behind in education due to lack of infrastructure so that they can enter the mainstream of society and participate economically.

6. Conclusion

An unforeseen pandemic such as Covid 19 had caught the world unawares and the loss to the world was unimaginably huge in many sectors. Be it global medical emergencies such as Covid or Economic Developmental activities or any other human made disasters such as wars or communal and ethnic conflicts, the governments and society should not let education be derailed. Indian Government launched the scheme Bharat Net to provide internet access to government institutions and schools during covid pandemic to provide continued education (Pib.govt.in., 2021). However, more intensified efforts could be made by government to provide Internet access to remote areas in the rural and tribal communities. Without internet and digital infrastructure rural and tribal communities would be left behind in education compared with the mainstream of the society in normal circumstances as well conditions such as pandemic. In the absence of education, many other social problems could emerge. Society has come a long way by ensuring quality education for most people and people who were left behind have been integrated into the mainstream of society. Social workers have contributed immensely to this endeavour. In this era of rising nationalism, authoritarian leaderships and xenophobia, the need emerges for social worker's voices to be unified, globalized and protected to safeguard the vulnerable and one such area is the Digital Divide and inequality in education.

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Obtained.

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The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Data sharing statement

No additional data are available.

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