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Digital Inequality in the Post-Pandemic Era: Evaluating the Role of Internet Access in Achieving Quality Education (SDG 4) and Reducing Inequalities (SDG 10) in Pakistan

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Abstract

The COVID-19 pandemic significantly increased the level of awareness and visibility of existing digital inequalities in Pakistan, thus creating unprecedented disruptions in education and exacerbating previously existing socio-economic inequities. The purpose of this research paper is to identify Internet Access as a necessary factor for achieving the goals of United Nations Sustainable Development Goal 4 Quality Education and SDG 10 Reduced Inequalities in the post-COVID-19 era in Pakistan. Based on secondary data from government sources, international organizations (ITU, UNESCO, UNDP, World Bank), and academic journals, this study conducts a systematic review of the literature. In addition, this study conducts a multi-dimensional assessment of the digital divide by identifying four primary dimensions: access, affordability, digital literacy, and relevant content. The effects of these four dimensions are assessed to determine how they compound each other. The results disclose that the rapid, compulsory transition to remote learning during the lockdowns works in all areas.

Keywords: Internet Access, Post-Pandemic Education, Digital Inequality, Online Learning, Social Justice.

Introduction:

The global pandemic of COVID-19 made a significant impact on the remote education field resulting in an historic, and a world wide, test of the digital preparedness of the majority of the countries around the world; and for Pakistan specifically, this abrupt change from traditional education to remote education (online) was not just a logistical challenge, it created a severe socio-economic and educational disaster; it also revealed and magnified the structural inequities that have existed for years however these have rarely been discussed within the context of policy at a national level. Before the outbreak of the pandemic, Pakistan was already dealing with a chronic education crisis, which was marked by outrageously high out-of-school rates i.e., an estimated 22.8 million children aged 5-16 and, at the same time, was experiencing severe quality deficits and significant disparities that were reflective of gender, urban-rural and socio-economic divides (Pakistan Ministry of Federal Education, 2021). In such a scenario, the digital divide the split

between those who have effective access to modern information and communication technology (ICT) and those who do not, was not seen as a minor issue, but as the major fault line that decided the continuity, quality, and equity of education when the school gates closed in March 2020 (Anwar,2023)

The paper highlights that in the aftermath of the pandemic, the ability to access the internet in a meaningful way has become a sine qua non, an essential condition for the actualization of crucial Sustainable Development Goals, particularly SDG 4 (Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all) and SDG 10 (Reduce inequality within and among countries). The Pandemic has illustrated in stark relief how digital inequality can cause educational exclusion and push people further down the ladder socially and economically. It has also been a loud and clear signal to policymakers, educators, and civil society organizations that connectivity is a necessary component for the development of any kind. The importance of this research is to the timely occurrence of the post-pandemic "new normal", the intermixing of the digital and physical spheres of education that now cannot be undone. It does not just record the crisis, but rather, it informs the future through its analysis of the disparities that have been experienced, adopting the method of a future-oriented, justice-centered approach towards the development of digital infrastructure and policy in education. The paper, by anchoring its analysis in the SDG framework, links Pakistan's domestic issues with a global development agenda, thus making it clear that the struggle for digital equity is universal and, at the same time, highlighting the specific conditions of the Pakistani context.

Literature Review

The term "digital divide" has greatly benefited the evolution of different theories since it was first introduced in the late 20th century. At first, the debates were mainly centered around the basic binary notion that the digital divide only consisted of the physical access gap, the availability or nonavailability of computers, and getting online (Norris, 2001). Although this viewpoint was very basic and fundamental, it was still unable to illustrate the intricate nature of digital exclusion. Among others, van Dijk (2020) and Warschauer (2004) were the ones pushing the boundaries of the notion to cover a spectrum of divides that are interlinked: starting with access and going to usage, then to skills (the second-level divide), and finally to the outcomes and benefits derived from technology use (the third-level divide). This multi-stage model acknowledges that just being connected does not ensure that the user will be able to take full advantage of the connection or that his/her life will be transformed positively. In the specific context of education, this multidimensional framework translates into four interdependent barriers:

- The Access Divide: The first layer of the digital divide is marked by the uneven distribution of digital gadgets (smartphones, laptops, tablets) and the presence of dependable, fast broadband or mobile internet. This also covers the so-called "last-mile" connection to users and the standard of the connection.
- The Affordability Divide: The distinction between economic availability and physical availability is that the barrier belongs to the economic side. These include items such as device costs, costs of data bundles and electricity costs that can be compared to the income of a household. The ITU's "data poverty" metric measures the amount of income a household must pay for a basic data bundle (ITU, 2022).
- The digital literacy divide: A group of skills, abilities, and confidence for using technology in a way that will assist with learning needs effectively and critically. Both educators and learners are affected by this issue. Digital literacy is not just knowing the technology but also having

the cognitive skills of discerning the quality of information, communicating through the digital medium, and being safe online.

- The Content and Pedagogical Divide: If the digital content available is not relevant, accessible, or pedagogically sound, a divide still exists even if access, affordability, and skills are present. This encompasses the issue of educational resources not being available in local languages (Urdu, Sindhi, Pashto, Balochi, etc.), lack of culturally appropriate materials, lack of content for students with disabilities, and above all, lack of teacher training in effective digital pedagogy. This divide points out that technology is a tool and not a teacher; its educational value is determined by pedagogical design.

A significant amount of research published in reputable journals such as Computers & Education has demonstrated a strong and recursive relationship across the globe between digital exclusion and lower educational attainment, which subsequently leads to and worsens the cycles of long-term poverty and social inequality (Hohlfeld et al., 2017; Selwyn, 2004). For the past years, UNESCO (2020) has been cautioning about a "digital learning paradox" in which the use of technology without considering equity may result in the worst scenario of not only amplifying but also spreading the inequalities already existing instead of diminishing them. This is especially true in such places as Pakistan (Canton, H. 2021).

Before the pandemic, the research on the digital landscape in Pakistan pointed out large gaps. The studies reported ICT access and usage disparities between urban and rural areas and among men and women, which were often connected to the general socio-economic and cultural situations (Qazi et al., 2018; Zulfiqar et al., 2019). The pandemic acted as a misfortune yet a huge natural experiment in which these theoretical concerns were confirmed, while again and again, local literature reported severe learning losses, more people's psychological distress, and increased dropout risks among the student populations that were digitally disconnected (Khalid & Khan, 2021; Malik & Rizvi, 2021). Thus, the purpose of this paper is to bring together the already existing and the newly found research into a unified analysis set by the SDGs.

Research Objectives

- To investigate how the multi-aspect digital divide has developed in Pakistan and what this relationship is to the education sector;
- To analyze how the divide impacts the achievement of SDG 4 and SDG 10, both in terms of the pandemic and the ongoing post-pandemic recovery process; and
- To suggest a Comprehensive Practical Policy Framework to overcome the digital inequality and therefore support a stronger pathway for the long-term development of Pakistan for all.

Research Questions

- What factors contribute to the digital divide, access, affordability, literacy, and content in Pakistan's education system, and how do demographic and geographic elements influence these issues?
- How has the digital divide in Pakistan hindered SDG 4 (Quality Education) and fueled inequality under SDG 10 during and after the pandemic?
- Why are multi-stakeholder policy interventions essential for ensuring that internet access is a basic, equal, and inclusive utility that enhances education for all and reduces societal inequalities in Pakistan?

Research Methodology

This study utilizes a qualitative, interpretative approach, which is fully supported by a thorough and methodical desk review of secondary sources. It is announced by Snyder (2019) that such methodology is fitting for accomplishing the integration of existing knowledge, discovering the trends among various data sources, and creating a complete storytelling analysis of a complicated social-technical case. The process of data gathering was mainly concerned with combining and scrutinizing information from four major sources:

- International Reports and Databases: The primary sources comprise the flagship publications and country-specific data from the International Telecommunication Union (ITU), UNESCO, UNICEF, the World Bank, and UNDP, among others. These sources provided strong metrics for measuring connectivity, affordability, and education as well as inequalities.
- Official Information and Official Documents: The Digital Pakistan policy, the National Education Policy 2021, the reports of the Pakistan Telecommunication Authority (PTA), the Pakistan Bureau of Statistics (PBS), and the Ministry of Federal Education and Professional Training provided a starting point for analyzing the situation with respect to official policies and official guidelines.
- Academic Research: To enhance the science-based perspective, empirical research and theoretical models available through a review of academic literature from internationally recognized publications (Telecommunications Policy, Computers & Education, International Journal of Educational Development) and research archives of universities in Pakistan were reviewed.
- Civil Society and Non-Governmental Organization Research: Reports from organizations such as Idara-e-Taleem-o-Aagahi (ITA), the Annual Status of Education Report (ASER) Pakistan, and the Alliance for Affordable Internet provide useful information about data collection at the local community level and the differences between the formal statistics and the informal or unreported issues that are not included in the formal statistics.

An analytical approach to identify themes was conducted, whereby all of the information received from each of the different data collection methods employed in this research was grouped together according to the different elements of the digital divide, as well as the effects of it upon the target groups of SDG 4 & SDG 10. This methodological approach will provide an opportunity to validate the findings of the research via triangulation of the data collected; however, the approach will also allow for an overview of the complexities between the elements of technological infrastructure, educational policy, and social inequalities in Pakistan, which exist over time (Snyder, H. 2019).

The Anatomy of the Digital Divide in Pakistan

Access and Infrastructure: The Geographically Skewed Network

The telecommunications situation in Pakistan is somewhat complicated, as the impressive total figures hide the deep disparities and inequalities under the surface. The Pakistan Telecommunication Authority (PTA, 2023) reported that in the early months of 2023, the number of mobile phone broadband subscribers in the country was around 191 million, while the number of 3G/4G users was about 124 million. Even though these numbers indicate that mobile phones are widely used, they are misleading (Harrison, D., 2021). A subscription does not guarantee access that is uninterrupted, dependable, or individual. Rather, a subscription does not guarantee access that is uninterrupted, dependable, or individual. The distribution of the telecommunications infrastructure is extremely biased towards the urban areas and the main highways.

The International Telecommunication Union (2022) has made an estimate that more than 80% of the urban population has access to 4G mobile broadband, and the same figure for rural populations is only 35-40%. Huge areas of rural Sindh, Baluchistan, and Khyber Pakhtunkhwa's far-off

districts, as well as Gilgit-Baltistan, experience inadequate or no broadband connections at all. Fixed-line broadband penetration continues to be at an extremely low level of less than 5% nationwide, and it is almost entirely an urban luxury. The lack of devices only worsens the connectivity gap. In lots of low and middle-income families, a single smartphone gets passed around among the members of the family (Iyengar, R. 2020). This phone is often utilized for the income-generating or communication needs of the male head of the family rather than for a child's education. The ownership of laptops or desktop computers is very rare outside the affluent households in the urban areas, and hence, the online learning for activities like writing assignments or research is nearly impossible for the majority of the population (Women, G. C., 2020).

The Affordability Barrier: Data Poverty in a Low-Income Economy

Affordable internet access continues to be a major challenge despite the presence of fierce competition in the telecom industry and falling nominal data prices. According to the Alliance for Affordable Internet (2021), Pakistan was placed in the low affordability group globally, but these national average masks the truth for the low-income population. Data is still considered costly in terms of income for the poorest households. Even for the most disadvantaged 20% of families, a basic 1GB data package greatly inadequate for video-based learning, could take a big slice out of their weekly income. The term "data poverty" aptly describes the situation (Qureshi, J. A. A., 2021) Moreover, even the price of an entry-level smartphone is a huge investment for a low-income family, as it often equals several months' salary. This one-time expenditure, combined with the regular data costs and the erratic power supply (which incurs additional charging costs), has made significant digital inclusion a distant dream for millions.

The Gender Digital Divide: A Deep-Rooted Disparity

Among all countries, Pakistan stands out as one of those with the biggest differences in terms of digital access between men and women. Women in Pakistan are said to be 38% less likely than men to make use of mobile internet, as reported in the GSMA's (2022) Mobile Gender Gap Report. Such a huge difference is not by chance but is rather the result of a combination of barriers that are deeply intertwined with each other: socio-cultural norms that limit women's movement and freedom, fears of online violence and harassment that keep women away from the virtual world, and economic dependence that leads to men being chosen for technology purchases. In most families, in case there is only one phone, it generally is in the hands of the father or the oldest son. For young girls, this implies that access to their education is very much controlled by male relatives, which in turn makes it harder for them to learn consistently (Menzies, J., 2025). This digital gender gap is a mirror and a reinforcement of the existing gender gap in education, and hence leads to a position where girls and women are doubly disadvantaged.

The Digital Literacy Chasm: A Systemic Weakness

There are widespread digital literacy shortcomings throughout Pakistan's environment, referring to individuals' ability to appropriately apply, understand, and create using technology; these shortcomings include not only students but also their teachers and their parents. The majority of the population, including the always-on digital generation, very often called "digital natives", do not possess the most basic skills that go beyond the use of social media and chatting apps. The problem is especially profound among the teaching staff across the board. Khan et al. (2022) performed a study and reported that a vast number of public-school teachers, particularly in rural regions, found it very challenging to handle the most basic digital teaching tools (like Learning Management Systems, video conferencing software, and digital content creation) during the pandemic. Many of them had never been formally trained (Colom, A., 2020). The absence of

pedagogical digital competence implied that even when platforms were available, the caliber of instruction went down drastically, thus online education became a one-way communication of unchanging content rather than a vibrant learning experience of interaction.

Impact on SDG 4 (Quality Education): Exclusion, Loss, and the Quality Deficit

- The pandemic-triggered school closures that began in March 2020 and only allowed for limited and temporary re-opening, hit more than 40 million students in Pakistan directly (Hohlfeld, T. N., 2017). TeleSchool (a national television channel) and Taleem Ghar (radio and TV content) were among the initiatives taken by the state as a very practical stopgap solution. Nevertheless, these were inherently limited to one-way broadcasting with no interaction, feedback, or assessment between the teacher and students. They were a replication of the outdated, transmission-style pedagogy on a new medium and could not even think of utilizing the interactive potential of digital technology.
- Exclusion from Learning: The situation for students without reliable internet, a dedicated device, or a supportive home environment was such that even these limited alternatives were often out of reach. A survey by Idara-e-Taleem-o-Aagahi (2021) gave a heart-wrenching glimpse: about 30% of children in rural and low-income urban households surveyed had not had access to any form of remote learning (TV, radio, or online).
- Learning Losses Catastrophic and Students Dropping Out at an Increasing Rate: In its report titled "Learning Poverty", the World Bank (2022), stated that a 'learning poverty' exists when an individual cannot read or comprehend a basic written text by age 10, and that learning poverty in Pakistan will increase dramatically as a result of the COVID-19 lockdowns. It is estimated that the long-term economic effect of this loss of human capital could reach into the billions of dollars. More immediately, the disruption created a strong push towards dropping out, especially for adolescent girls. Schools being closed, coupled with economic pressure, made it even more difficult for girls to resist early and forced marriage or going into domestic labor, thus making a return to education even harder (Malik & Rizvi, 2021).

Impact on SDG 10 (Reduced Inequalities): The Digital Catalyst of Disparity

The digital divide functioned as a powerful amplifier of Pakistan's pre-existing inequalities, directly contravening the aims of SDG 10.

- Geographic Inequality: The urban-rural divide was suddenly transformed into a huge educational chasm that could not be overcome. The child studying in a private school in Lahore or Karachi could be attending synchronous online classes on Zoom with interactive digital whiteboards (Norris, P. 2003). On the other hand, the child living in a village in Umerkot (Sindh) or Chitral (KPK) probably had no connection, no device, and even no electricity regularly. The difference in the quality of education will affect the regions and migration patterns within the country for a long time (Zahid, M. A., 2024)
- Socio-Economic Inequality: The transition to remote learning made it so that a significant part of education costs was privatized. The upper and middle-class families outfitted their homes with fast internet, several electronic devices, and private tutors, whereas the lower-class families, already in financial crisis, could not even afford the basic online schooling expenses. It practically turned education, a public good, into a commercialized service where the quality was directly dependent on the wealth of the household, thus speeding up the process of poverty being handed down from one generation to the next.
- Gender Inequality: The pandemic, along with the digital response, posed a serious threat to the hard-fought, small steps taken towards female education enrollment. In households where the resources were limited, conservative boys were often the ones who got to use the single device

owned by the family. Moreover, girls usually do not have a separate space in the house, which makes it hard for them to join online classes without disturbing others. The fear of unsupervised girls being online and not being safe, or their reputation being at stake, also caused many families to limit the girls' access.

- Disability Inequality – Children with Disabilities: Digital education (due to emergency) almost ignored the needs of children with disabilities when it suddenly rolled out. Online platforms were lacking in vital accessibility tools such as screen readers, closed captions, compatibility with assistive technology, etc. Many times, the digital material wasn't created using universal design practices either. It left another group that is largely marginalized in our education system, unable to access remote learning, which completely violates the "leave no one behind" promise from the United Nations Sustainable Development Goal (SDGs).

Internet Access as a Foundational Utility and a Site of Struggle

It is evident from the evidence collected that it is the same: In post-pandemic Pakistan, the lack of significant internet access is an underlying structural barrier to achieving SDG 4 and SDG 10. The digital inequality that was initially dismissed as a small problem by ICT Ministries has become a major factor that influences life chances, social mobility, and national development; this is now regarded as a major issue of social justice. Nonetheless, the conversation needs to go beyond the mere narrative. The analysis of the multi-dimensional divide indicates that a limited perspective on physical access may lead to what van Dijk (2020) calls a "second-level divide." In this situation, people may get access to internet connection but will not be able to reap the benefits because they will be lacking in the necessary skills, relevant content, or supporting ecosystems (e.g., family support, stable power supply). Consequently, it is necessary to have a comprehensive policy that deals with access, affordability, literacy, and content at the same time.

A fundamental conflict in this discussion is the contention between the state and the market. Provided that they are seeking return on investments, private telecom companies will unavoidably center their attention on developing networks, particularly in urban and peri-urban areas where there is high traffic and hence, the possibility of high returns on investment. The area covered by the state is not subject to discussion because its role encompasses so many things, such as equity regulation, investments in infrastructure in the areas that are not commercially viable, direct assistance to the poor in the form of subsidies, and finally, ensuring that digital education fulfills public interest rather than commercial ones. The federal "Digital Pakistan Vision" and "Right to Internet Access" proposals can be viewed as having similar needs conceptually, but their implementation has been fragmented, poorly budgeted, and inadequately monitored. After the 18th Amendment, education was devolved to the provinces, which adds to the already complicated issue of a unified national strategy requiring coordination among the federal and provincial governments that has never been seen before (Selwyn, N. 2004).

Additionally, there must be a discussion about the pedagogical imperative. Technology does not simply provide material, but changes the way students learn completely. The time post-pandemic is a perfect opportunity to move away from the "poor physical pedagogy in the digital space" (the "$1000 pencil" problem) and begin to think of education as more student-centered and collaborative, with an emphasis on interaction, and utilize technology to assist in this area.

Conclusion

It is now evident with the COVID-19 pandemic that access to digital connectivity is no longer an optional component of life in the 21st Century but rather a required utility, similar to those of clean water, roadways, and electricity. As such, access to digital connectivity will become a requirement for equity in education. Therefore, the digital divide is not simply an issue of technology or

economic disparity, but is also an issue of social justice and can be considered the foundation of Pakistan's path to achievement of the Sustainable Development Goals (SDGs). Unless Pakistan adopts an ambitious multi-staged and coordinated plan for digital inclusion through social investment, the country will certainly develop into a two-tiered society, one composed of a competitive elite that is digitally included and a large majority that is digitally disconnected and therefore marginalized. Therefore, the following recommendations can serve as a framework for action.

Policy Recommendations

1. Declare Broadband an Indispensable Public Utility: The government must take the lead in a national movement to define broadband as an ultimate service for all.

- Action: Quickly implement the "National Broadband Policy," make a huge increase in the budget for the Universal Service Fund (USF) with a requirement for projects in rural and underserved areas, and require telecom companies to share their infrastructure to lower costs.
- Innovation: Test and make available creative solutions such as community networks, TV White Space technology, and alliances for Low-Earth Orbit (LEO) satellite internet (e.g., Starlink) for the most isolated areas.

2. Implement a Robust Affordability Framework: The poorest 40% of the population will have the devices and data available at an affordable cost.

- Action: Launch a "Digital Education Voucher" program for economically challenged families, which can be used for the acquisition of inexpensive devices or data packages. Require telecom companies to sell at a very low price "education data packages" for which users get free access to approved online educational platforms and websites like Pakistan's e-Learn portal, Khan Academy, etc.
- Fiscal Policy: Tax and customs duties on importing and selling low-end smartphones and tablets for educational purposes will be either eliminated or substantially reduced.

3. A Nationwide Digital Literacy Campaign Should Be Started: Acknowledge the gap in skills possessed by the whole of society and try to eliminate it.

- Action: Make digital literacy a compulsory subject from Grade 3 across the nation and give a new emphasis on critical skills that surpass the basic operating level.
- Teacher Training: Start an obligatory, giant-scale, and perpetual in-service training program for all teachers working in public schools on digital pedagogy, online student engagement, and content creation. It should be the focal point of education budgets.

4. Invest in Inclusive, Contextual Digital Content Development

- Action: The large-scale creation of interactive and engaging digital learning content in Urdu and all major provincial languages synchronized with the national curriculum should be publicly funded as an investment for the public good.
- Accessibility: Students with disabilities are to be served by enforcing mandatory accessibility standards (WCAG) for all publicly funded educational platforms and content.
- Open Licensing: Cut costs and allow local adaptation by adopting and promoting Open Educational Resources (OER) to be the standard practice.

5. Gender-Responsive Digital Policies to be Enacted and Enforced: The gender digital gap is to be systematically closed.

- Action: Women and girls to be specifically targeted for digital literacy programs, and safe and female-only spaces to be used for conducting them where necessary. Raising awareness among the public by means of campaigns involving community and religious leaders to tackle socio-cultural barriers.

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