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DIGITAL INEQUALITY AND EDUCATIONAL EQUITY IN PAKISTAN: A CRITICAL ASSESSMENT OF POLICY IMPLEMENTATION AND PROGRESS TOWARDS SDG 4

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Abstract

Digital inequality is important obstacle in the way of education equity in Pakistan, especially for the students of the low-income families, rural areas and disadvantaged social groups. Although there has been a roll-out of different national education policies and digital development initiatives, access to internet connectivity, digital devices, technological infrastructure, and digital literacy remain unequal, which impacts on educational opportunities throughout the country. In this context, this study critically analyzes digital inequality and educational equity in Pakistan with a special focus on policy implementation and efforts towards achieving Sustainable Development Goal 4 (SDG 4) of inclusive and equitable quality education for all. The study uses a qualitative research approach, specifically in form of policy document analysis and secondary data gathered from the government documents, national education documents, UNESCO, UNICEF, and World bank reports. It examines the key aspects of the digital divide, such as socioeconomic, gender, urban-rural, and educational and digital infrastructure gaps. Moreover, it assesses the impact of current government measures for digital inclusion and achieving quality education. Special focus is placed on the difference between policy commitments and the actual implementation of these policies at the national and provincial level. It emphasizes the need for the availability of cheap internet connectivity and enhanced technological facilities, digital literacy, teacher training, and inclusive education policies to minimize educational gaps. It highlights the need for improved institutional coordination, policy implementation and monitoring of digital education initiatives to make SDG 4 a reality in Pakistan. The study offers policy suggestions to ensure equitable access to digital learning and improve the efforts towards inclusive and quality education in Pakistan.

INTRODUCTION

Educations has been acknowledged as an integral part of human right and base of social development, economical growth and national progress. The use of digital technologies in education has revolutionized the instruction, learning, communication, and educational resource access in the modern world. With the

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rise of internet connectivity, smartphones, computers, online learning platforms and digital materials, students and teachers have new possibilities. But these technological advances have not been equally beneficial to everyone. People and communities have a digital divide due to unequal access to digital devices, internet connectivity, digital infrastructure and digital skills. This divides is referred to as the digital inequality or digital divide. Digital inequality is an emerging educational issue and is a significant problem in developing nations, where unequal socioeconomic opportunities, geographical barriers, and poor infrastructure create hurdles to the effective use of digital technologies in education (UNESCO, 2023; World Bank, 2020).

Digital inequality goes beyond the mere presence or absence of Internet access and electronic devices. It also incorporates the quality of Internet services, cost of digital resources, technological knowledge, digital literacy, and the effectiveness of using technology for learning. According to Van Deursen and van Dijk (2019), the digital inequalities are linked to access to the internet, proficiency with it, and how people use it. Likewise, Robinson et al. (2020) note that the social and economic context, such as income, education, geographical location and access to technological resources, impact digital inequalities. The inequalities are directly connected to students' access to opportunities to engage in online learning, access academic information, acquire digital skills and have a successful educational experience. Digital inclusion is therefore an important factor in encouraging equal education opportunities and the inclusion of all parts of society in the process of technological development.

Digital inequality has emerged as a significant hurdle in achieving education equity and inclusive learning opportunities for Pakistan. There are a number of structural issues that need to be addressed in the country's education system, such as disparities in educational facilities, poverty, a lack of education infrastructure, educational quality and differences between urban and rural communities. Digital technologies have increasingly become part of educational activities, but access is still not equal across all regions and social groups. Internet access, computers, smart phones and access to digital learning platforms are generally more readily available to students who reside in major urban areas than to students who reside in remote and rural areas. The students' access to digital education is limited due to, among others, low bandwidth, a lack of electricity, financial limitations, and poor technological infrastructure in many disadvantaged regions. This situation leads to unequal learning opportunities and negatively impacts learning outcomes of the disadvantaged children from the National Education system due to the availability of modern technology (Pakistan Institute of Education, 2023; UNICEF, 2021).

Another crucial aspect of digital exclusion in Pakistan's education system is gender inequality. There may be extra barriers for female learners and those who come from rural or low income homes in accessing digital devices, using the internet and accessing online educational opportunities. Girls' use of technologies can be further constrained by social expectations, household duties, financial reliance and restrictions on technology use. The United Nations Development Programme (UNDP, 2023) underscores the issue of women's access and use of digital technologies, which is a major challenge in Pakistan, impacting their educational, economic, and social opportunities. The fact that these challenges highlight the social and economic nature of digital inequality, which needs socially inclusive policy, is noteworthy. Therefore, to achieve equity in education, access to the same technological resources is not enough, it needs to take into account the different lived circumstances and barriers faced by disadvantaged young people.

With COVID-19, the stark reality of digital divide in Pakistani education system also came to the fore. There was an increased use of online classes, digital learning platforms, television education and other alternative

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learning methods during times of school closures. But many students could not participate effectively due to the lack of personal computers, smart phones, stable Internet connection, or an appropriate learning environment at their homes. The pandemic showed that those who were in a privileged and rich family were better capable of continuing their studies than those from disadvantaged families, due to their technological and economical advantages. This situation underscored the need for a digital education system that is inclusive and can provide services to students in emergency and regular education settings. Additionally, UNESCO (2023) points out that while educational technology is a facilitator of learning, effective use of learning technology relies on proper infrastructure, accessibility, teacher training and proper educational policies.

Background of the Study

Education is regarded as one of the most pivotal pillars of social development, economic growth and human empowerment. The modern world has revolutionized the education system with the advent of technological developments such as digital learning platforms, online classrooms, electronic libraries and internet-based learning resources. Digital technologies can serve as a means for students and teachers to access educational resources, interact with educational institutions, and acquire key skills and knowledge. The use of information and communication technologies (ICTs) has also opened new opportunities to enhance the quality of learning, learning outcomes and access to education. But not all people benefit equally from these developments as the access to technological resources is still affected by the socioeconomic situation, geographical location, gender, and education (van Dijk, 2020).

Digital inequality has become a major obstacle in development countries, especially in the countries which are suffering from poverty, low infrastructure and unequal distribution of educational resources. It is about more than just differences in Internet access and digital devices; it is also about differences in digital literacy, technological skills, affordability, and effective use of digital resources. A majority of students with access to computers, smartphones, stable internet connections and digital learning platforms have better opportunities for engaging in modern forms of learning. Conversely, children from low-income families and rural areas might face challenges in accessing online learning resources and learning technological skills. These disparities can exacerbate inequities in the learning environment and restrict academic and career growth (Robinson et al., 2020).

Digital inequality is intricately linked to socioeconomic inequality, geographical disparities, gender barriers, and educational infrastructure deficits in Pakistan. The country has made strides in telecommunications and digital services, but access to quality internet connectivity and digital education resources are uneven. Student access to technological facilities is likely to be greater in major urban areas than in rural and remote areas. The factors of financial constraints, power shortages, poor institutional facilities and the lack of digital literacy continue to limit disadvantaged learners' engagement in digital education. Such hurdles show that without proper policy and inclusionary implementation, technology advances can't ensure equal opportunities for learning (Jamil, 2021).

Statement of the Problem

Digital divide is now a big hurdle in the way of Pakistan toward educational equity. While digital technologies have opened up new ways to access education and enhance learning experiences, the advantages are not equally shared by all students, with socioeconomic and geographical variants. Low-income students, students from rural areas and students from marginalized communities often have trouble accessing computers, cell phones, a quality internet connection, and online learning. These obstacles hinder their access to technology-enabled learning and can contribute to the inequalities in learning opportunities

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that exist between advantaged and disadvantaged learners.

Research Questions

1. What is the impact of digital inequality on educational equity for students from different socio-economic and geographical backgrounds?
2. What are the big challenges in digital education resources access in rural and urban areas in Pakistan?
3. How have government policies and digital education initiatives tackled digital inequality in Pakistan?
4. How far has Pakistan come in terms of SDG 4 goals of digital education and inclusion?
5. How can digital inequality be tackled and can inclusive and equitable quality education be ensured in Pakistan through policy measures?

Research Objectives

1. To examine the effects of digital inequality on educational equity and on the access for students to learning opportunities.
2. To present socioeconomic, geographical and gender related challenges of digital education in Pakistan.
3. To evaluate critically the execution of government policies and digital education programmes.
4. To assess Pakistan's progress on Sustainable Development Goal 4 on Digital Inclusion and Educational Equity.

Significance of the Study

The study is important because it explores the association of digital inequality and educational equity in Pakistan in relation to the obstacles that hinder disadvantaged students from enjoying equal educational opportunities. Education has become a technologically mediated field, and digital inclusion becomes a key determinant in the quality of education and the equalizing access to modernity in learning spaces. The study explores the variations in internet connectivity, digital devices, technological infrastructure and digital literacy, in order to gain insight into the impact of digital inequality on the learning experience of students.

Scope of the Study

This study is limited to the digital inequality and educational equity in the context of Pakistan and government policy implementation and development towards SDG 4. It makes a study of availability, accessibility, affordability and utilization of digital educational resources by students from different socio-economic and geographical background. The study examines various aspects of digital inequity such as Internet connectivity, computers and cell phones, digital literacy, technological infrastructure, and online learning resources. It also explores gender disparities, rural-urban disparities and struggles of students from low-income families.

LITERATURE REVIEW

With the predominant use of information and communication technologies in education, employment, communication and social development, digital inequality has emerged as a significant area of academic study. New technologies such as internet access, digital devices and online platforms have opened new educational opportunities, but access to these opportunities is not equal for people and communities. Previous studies have shown that digital inequality doesn't just stem from access to technology, but there can also be inequalities in internet quality, costs, digital literacy, technological skills and effective use of digital resources. Van Deursen and van Dijk (2019) define digital inequalities as being shaped by inequality in access to digital technologies, in digital skills, and in how digital technologies are used. Likewise, Ragnedda and Ruiu (2020) state that social and economic inequalities are significantly linked to digital inequalities. These results show that improvement of technology is not a guarantee for equal opportunities for all citizens of society.

The connection between digital inequality and educational opportunities has been a topic of extensive study in recent years. Digital technologies enable students to get access to

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online lectures, electronic books, research databases, virtual classrooms, and international educational resources. Students may however have problems with technology-based learning if they do not have reliable Internet access, the appropriate digital devices, and the technological skills necessary to participate. Robinson et al (2020) say that digital inequities are linked to wider social inequalities and can impact people's learning and earning prospects. This is also the point raised by Beaunoyer et al. (2020) who argue that already vulnerable social situations can exacerbate digital exclusion especially when using the internet is crucial for accessing social services. These research findings suggest we need to consider digital inequality not only as a technological problem, but as a social and educational concern.

Another education equity concept related to digital inclusion is that of digital equity. It means providing equitable access to good quality education for all children regardless of their socio-economic status, gender, and location and conditions. Equity does not mean that all students must have exactly the same resources, but rather that the needs of disadvantaged students must be met in order to support their learning to be successful. Ainscow (2020) suggests that all barriers that prevent children and young people from participating and learning need to be identified and overcome if educational inclusion is to be realised. UNESCO (2020) also notes the significance of inclusive education systems with learning opportunities for vulnerable and marginalized groups. These views imply that policies on digital education should have a particular focus on the more technologically and educationally disadvantaged students.

The pandemic COVID-19 further highlighted the connection between digital inequality and educational exclusion. Due to the school closures, educational institutions have had to implement online learning systems, teaching remotely, and utilizing digital educational resources. But it had also left some students without computers, smartphones, internet access, and learning environments. School closures impacted millions of global students, and UNESCO (2020) noted that educational systems' ability to deliver remote learning opportunities varied by country. UNICEF (2021) also noted that unequal access to technology is one of the barriers for children to participate in remote learning. The World Bank (2020) highlighted that for effective learning to take place, the technology infrastructure, the educational content and institutional readiness are required in the context of remote learning. This research has shown that digital inequality can be a catalyst in exacerbating existing educational inequities in the event of national and international emergencies.

Socioeconomic conditions also are examined as a factor in access to educational technology (ET) in the literature on digital inequality. Students can have access to computers, smartphones, and reliable internet services, or not, depending on the household income, parental education, employment status, and/or geographical area. The opportunities for students of financially better-off families to access online learning are generally higher than those offered to students of low-income families. During the pandemic, students' access to resources of digital learning has been pointed out as a major difference by the Organisation for Economic Co-operation and Development (OECD, 2020). Likewise, van Dijk (2020) discusses how inequalities in digital access are linked to broader socioeconomic inequalities and how these in turn shape people's capacity to reap the benefits of technology. The results of this study are especially significant in developing countries, where poverty and unequal infrastructure are still significant obstacles to educational inclusion.

Theoretical Understanding of Digital Inequality

The theoretical definition of digital inequality is the unequal opportunity to use, access and benefit from digital technologies. The initial debates on the digital divide were centered on the disparities between computer and internet users and non-users. In today's research

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literature, digital inequality is understood to be a multi-faceted concept that covers the availability of technology, its cost, digital skills, digital trajectories and the ways people use the Internet, as well as the results they produce in using technology. According to Van Dijk (2020), digital inequalities emerge from the differences in motivational access, material access, skills access and usage access. This vision illustrates that everyone with an Internet connection does not have equal access to the digital opportunities that it provides.

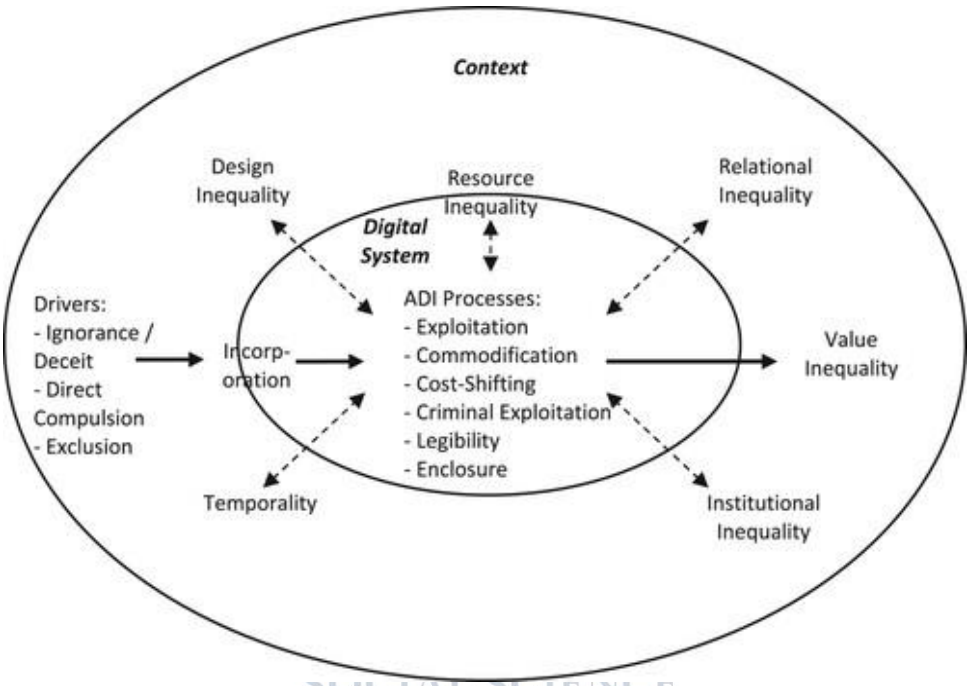

Fig 2.1 Theoretical Understanding of Digital Inequality

The digital divide theory is a valuable conceptual framework for studying disparities in technology access across persons and communities. This view implies that disparities in technological resources lead to disadvantages for populations that are not able to engage in digital environments on equal footing. Today however, these ideas are taken further and consider how access is received and how digital technologies are used effectively. Ragnedda and Ruiu (2020) explain that digital inequalities are connected with existing social inequalities and can influence individuals' opportunities to obtain social, educational, and economic benefits.

Dimensions of Digital Inequality in Education

Digital inequality is a complex phenomenon that can be divided into multiple components which affect students' participation in digital education. Such differences are found in Internet access, availability of digital devices, technological infrastructure, digital literacy, household income, and geographical location. It is essential to grasp these dimensions as educational exclusion is not the consequence of just one technological barrier. Rather, many disadvantages may coexist, and can result in unequal opportunities for learning for students from different backgrounds.

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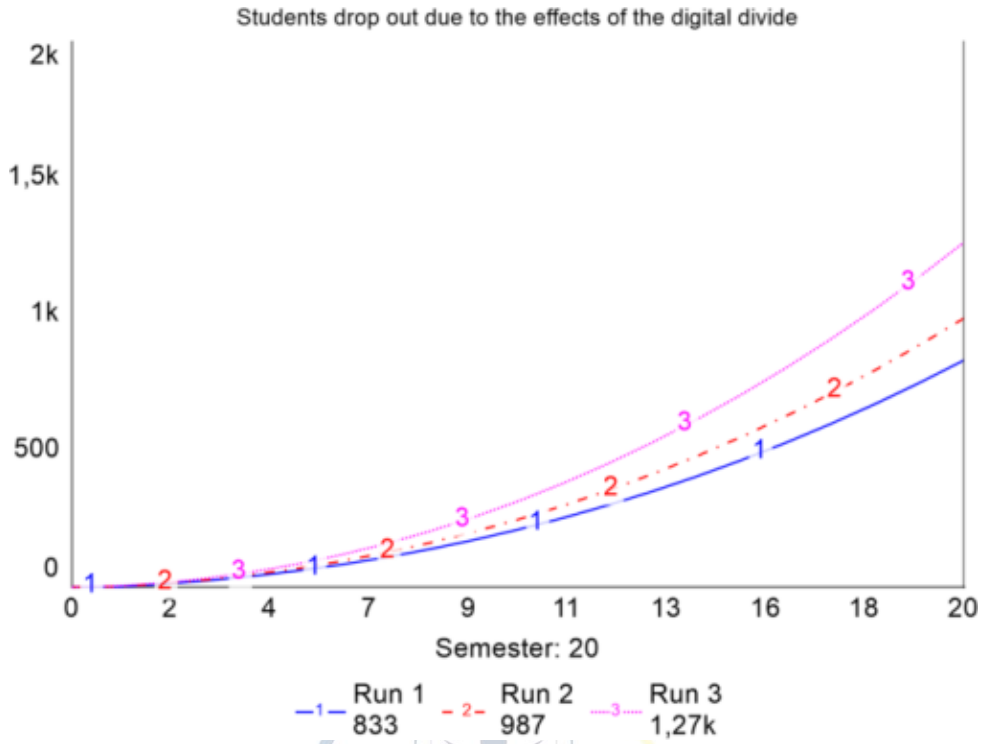

Fig 2.2 Dimensions of Digital Inequality in Education

The upcoming sections discuss the key dimensions of digital inequity within educational contexts.

Inequality in Internet Access

Access to the internet is very important in digital education. The students rely on Internet connection to join online lectures, connect with their teachers, access academic websites, download academic documents and interact in online classrooms. Nevertheless, there is an unequal distribution of internet access due to variations in geographical coverage, access quality and cost, and household resources. Students who reside in communities where broadband internet access is available have greater opportunities for digital learning than those in communities with limited or unreliable access to broadband.

Inequality in Digital Devices and Infrastructure

Having access to the right digital devices is another key part of digital inequality in the classroom. Digital learning platforms can be accessed with computers, laptops, tablets and smartphones for learning, assignments, research and communication with educational institutions. But the availability of these resources is not equal for students due to the difference in income of the family and institutional facilities. Some pupils have their own personal computers and access to good internet facilities, while others share mobiles or have restricted access to computer labs at school.

Digital Literacy and Skills Gap

Digital literacy is the knowledge and skills needed to use digital technologies responsibly, safely and effectively. It involves searching information, assessing online information, communicating online, creating academic documents and using educational applications. Digital literacy is a necessity because students may have access to Internet services and technological devices, but may not be able to use them effectively to learn.

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Socioeconomic and Regional Digital Divide

Socioeconomic inequality is an important factor contributing to unequal access to digital education. Household income, parental education, employment status, and living conditions both affect and are affected by students' access to digital devices and Internet services. While students of wealthier families can more easily afford access to technology, students from lower income families could face financial barriers for maintaining Internet access and obtaining educational technology. Such disparities may lead to inequitable learning opportunities and perpetuate existing social inequities.

Digital Inequality and Educational Equity

Access to technology resources is tightly linked with educational equity and digital inequality, as it affects students' access to contemporary education systems. Educational equity is the promotion of equal opportunities for quality education for all learners irrespective of their socioeconomic status, gender, geographical location or needs. If the digital resources are not distributed equally, there is a possibility that students from disadvantaged backgrounds may have challenges accessing the educational content, attending online classes, and building their technological skills. Such disparities may be exacerbated by these differences.

Digital Education in Developing Countries

Digital education is crucial in the field of educational development in developing countries due to its ability to increase access to learning resources, enhance communication, and boost educational participation. This can be achieved through online learning platforms and mobile educational applications, digital libraries, virtual classrooms, which can help overcome geographical barriers to education and bring educational content into students' hands, beyond the classroom. The success of these technologies, however, requires the presence of infrastructure, monetary resources, digital literacy and supportive educational policies.

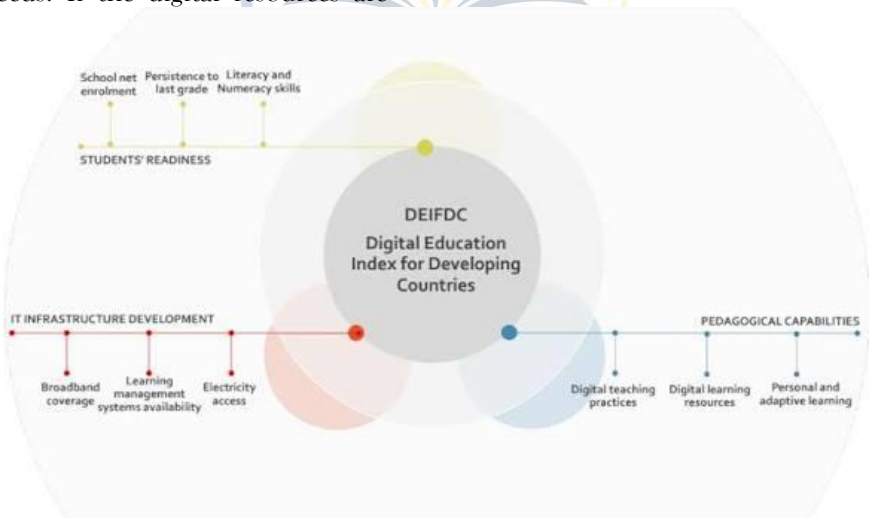

Fig 2.3 Digital Education in Developing Countries

In developing nations, the lack of internet connectivity, connectivity costs, electricity access and inequality in technological devices are often a challenge. These include barriers to effective adoption of digital learning systems by educational institutions. The Asian Development Bank (2021) calls for investments in digital infrastructure, human resources, and institutions for inclusive growth. Likewise, UNESCO (2023) makes the case that the effectiveness and contribution of ET to learning outcomes, and its accessibility, should be assessed.

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RESEARCH METHODOLOGY

Research methodology gives a systematic approach towards investigating the research problem to gather the relevant information and analyze the information and results to reach the objectives of the research. The methodological framework, used to explore digital inequality and educational equity in Pakistan is explained in the chapter, focusing on the implementation of government policy and progress towards Sustainable Development Goal 4 (SDG 4). The study aims to investigate the relationship between differences in Internet access, technological devices, technological infrastructure, digital literacy, socioeconomic situation, and geographical location on education opportunities.

The research method used in this research is qualitative, which is mostly secondary data and policy document. Documents, academic journal articles, reports by national organizations, and government publications are consulted to gain relevant information, as well as reports generated by international organizations, about digital development and SDG 4. The methodology also includes an analysis of the work done on the implementation of Government initiatives and the key challenges in the field of digital inclusion in Pakistan. This method is used as a foundation to review current policies and make recommendations for greater equity in education and access to digital tools.

Research Design

The research design used in this study is descriptive and analytical in nature which is qualitative in nature. Descriptive research design explains the current state of the digital access, educational infrastructure, technological resources, and digital literacy of various population groups. The analytical element explores the connection between these factors and considers how well government policies and initiatives have worked.

The research also includes a policy-oriented assessment to investigate to what degree national policies in digital education tackle the problem of disadvantaged students. Special emphasis is placed on the issue of how policy is implemented in practice and on the differences between policy goals and actual implementation. It looks at national and provincial educational programs, digital development programs and commitments at international level in regards to SDG 4.

The documentary research design is suitable because the study deals with the existing policies, institutional reports, academic papers, and previous collected educational information. Instead of experimenting and assessing students' performance, the research follows the scientific method by critically analysing available evidence to gain an understanding of the general trend of digital inequality and educational exclusion in Pakistan.

Research Approach

This study is qualitative in nature because it aims to comprehend and critically analyze the social, economic, educational and institutional factors resulting in digital inequality in Pakistan. Documentary evidence can be interpreted to examine the policy framework, institutional duties, implementation problems, and education gaps, as in qualitative research.

The interpretive critical approach is used to analyse the impacts of digital inequality on the educational opportunities of learners with different socioeconomic and geographical backgrounds. The study also takes into account the response of the government with respect to the issues like Internet accessibility, digital literacy, gender gap, technological infrastructure, and differences between rural and urban areas.

The study adopts an approach of reviewing documentary evidence in an inductive and thematic manner. The major themes that are relevant to the information are used to highlight common challenges, policy priorities, gaps in implementation and opportunities for improvement. This will enable an overall understanding of the linkage between digital inclusion, education equity and the progress in Pakistan towards SDG 4.

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Nature and Sources of Data

Qualitative secondary data were used as the main data for the research, which were obtained from published academic research studies, government documents, educational statistics, policy frameworks and reports from national and international organizations. The information available selected is focused on digital inequality, educational access, digital literacy, educational infrastructure, policy implementation, and sustainable development.

Primary Sources

Primary documentary sources, for this research, are original policy documents, original government publications, legislation, institutional frameworks, and original statistical reports. These documents contain first-hand information on government priorities, responsibilities of institutions, policy objectives, and implementation strategies.

The key primary documents are

- Digital Pakistan Policy 2018.
- National Education Policy Framework 2018.
- National education policy and planning documents.
- Official publications published by the Ministry of Federal Education and Professional Training.
- Pakistan Institute of Education's Reports and Statistical publications.
- The Pakistan Telecommunication Authority publishes its writings.
- This is Pakistan's official SDG 4 progress and monitoring documents.
- Government official statistics on digital development and education facilities.

Secondary Sources

Secondary data include pre-existing academic research, literature reviews, institutional analyses and reports on digital inequality, education equity, educational digital transformation, and educational development.

The study is based on secondary data from various organizations and publications including:

- United Nations Educational, Scientific and Cultural Organization (UNESCO).
- The United Nations Children's Fund (UNICEF).
- World Bank.
- United Nations Development Programme (UNDP).
- Asian Development Bank (ADB).
- International Telecommunication Union (ITU).
- Organisation for Economic Co-operation and Development (OECD).
- Academic research databases, such as Google Scholar.
- Academic journals and published research articles

Policy Document Analysis

Policy document analysis is one of the key methods used in this research as it is one of the main objectives of the study is to critically evaluate the implementation of digital education policies and its implications for educational equity in Pakistan. The approach is to look systematically at official documents, government policies, strategies, institutional reports and international development frameworks to see what they are aiming for, what their priorities are, how they are implemented and the outcomes expected.

The study examines how far current policies have come in tackling key aspects of digital inequality: internet access, cost of technological devices, technological infrastructure, digital literacy, gender inclusion and regional disparities. It also highlights the duties entrusted to the government institutions and the mechanism in place for developing and monitoring the digital education projects.

The connection between national policy commitments and education conditions is highlighted. It examines the extent to which policy documents have practical solutions for disadvantaged learners and adequate coverage of rural learners, low-income families, and female learners.

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The following criteria guide the policy document analysis

1. **Policy goals:** Statement of key goals pertaining to digital education and educational equity.
2. **Accessibility:** Review of steps taken to enhance internet connections and digital device access.
3. **Inclusiveness:** Evaluation of policies to tackle gender inequalities and disadvantaged groups.
4. **Implementation mechanisms:** The institutional responsibilities, financial arrangements and implementation strategies are examined.
5. **Monitoring and evaluation:** Identification of mechanisms for monitoring progress, and measuring policy effectiveness.
6. **SDG 4 alignment:** Evaluation of the relationship between national policies and international commitments towards inclusive and equitable quality education.

The research uses the aforementioned criteria to pinpoint strengths, weaknesses, and gaps in digital education policies in Pakistan.

Data Collection Methods

This study uses a systematic review of relevant documentary and published sources. Identification, selection and analysis of materials specifically focusing on digital inequality, educational equity and policy implementation in Pakistan.

Selection of academic literature is done by using the relevant research databases and scholarly search engines such as Google Scholar and the academic journal repositories. The sources for Government publications and policy documents are official websites of the Government institutions and for international reports from the publications of UNESCO, UNICEF, World Bank, UNDP and related institutions.

There are several steps to the data collection process

1. Identification of the relevant research themes and the keywords.
2. Looking for academic papers and institutional reports.
3. Recognizing national policies and government documents
4. Identifying the materials suitable for the educational and technological situation in Pakistan.
5. Reviewing documents created mostly in the 2018-2026 period.
6. Structuring gathered information to meet the research goals.
7. Benchmarking and evaluating policy intentions to evidence.
8. The top searches are digital inequality, digital divide, educational equity, educational digital policies, digital education in Pakistan, digital literacy, internet accessibility, gender-based digital exclusion, urban-rural educational disparities, and SDG 4.

Data Analysis Techniques

Qualitative thematic analysis and documentary analysis are used to analyse the collected information. Thematic analysis can be used to identify common themes, patterns, and issues within academic publications, government policies, and institutional reports.

The gathered data is presented in the following main analysis themes:

1. Availability of Digital infrastructure & internet connectivity.
2. Accessibility and accessibility to digital devices.
3. Digital literacy and technological skills.
4. Socioeconomic inequalities and access to education.
5. Gender-based digital inequality.
6. Digital education gap between urban and rural areas.
7. Government policy implementation.
8. Step towards Sustainable Development Goal 4.

The analysis looks at the impact of these themes on educational opportunities and on digital exclusion in Pakistan. Information from various sources is compared and contrasted to find similarities, differences and missing

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information from the available evidence. The study also adopts qualitative content analysis to analyze the policy goals, institutional roles, and policy implementation methods. The documents are analyzed to see if the objectives outlined in the document are relevant to the practical issues faced by disadvantaged students. Lastly, the results are analysed with respect to the research questions and objectives. The analysis offers a critical appreciation of the digital inequality – educational equality – government policy relation and areas that call for policy attention.

3.8 Selection of policy documents and reports

Documents and reports have been selected based on their relevance, credibility, publication source and relation to the research objectives. Official government publications, well-known reports from international organisations, peer-reviewed academic articles and recognised educational research publications are prioritised. This study focuses largely on papers that have been published in the last five years or so (2018 – 2026) on Pakistan's digital education policies and progress towards SDG 4. Earlier publications are included only if they contain valuable theory explanations or background information.

The following inclusion criteria are used

1. Materials that are directly connected to digital inequity and educational equity.
2. Studies related to digital education and technological accessibility in Pakistan.
3. Government policies and educational development policies
4. Publications relating to Internet connection and computer literacy.
5. Research that investigates gender-based and socioeconomic digital disparities.
6. Reports discussing educational development and SDG 4.
7. Publications from reputable academic and institutional sources.
8. When a document is not directly related to the research questions, lacks adequate source data, or does not offer relevant evidence on digital inequality and/or educational policy, it is excluded.

RESULT ANALYSIS

In this regard, digital education has gained significant relevance in the field of educational development, as technology offers possibilities to enhance the accessibility of learning resources, facilitate communication between teacher and student and increase educational services out of the classroom. Digital education has great significance in Pakistan due to the educational access issues, poverty, gender disparity, weak infrastructure, and disparities between the urban and rural areas. These challenges have an impact on how students are able to use technology to enhance their learning.

Table 1. Household Access to Digital Technology by Region in Pakistan

Digital access indicator	Urban (%)	Rural (%)	Pakistan (%)
Households with internet access	82	61	70
Households with computer/laptop/tablet	16	7	11
Households with mobile/smartphone access	98	95	96

To support digital development and educational opportunities, several policies and initiatives have been started by the Government of Pakistan. Key achievements are the Digital Pakistan Policy 2018, the National Education Policy Framework 2018, the TeleSchool programme, the eTaleem Portal, and various provincial education schemes. These are some examples of the increasing awareness of technology as a means for educational improvement. However, they are only effective when there is access to the Internet, inexpensive digital devices, power, a trained teacher and institutional support.

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Overview of Pakistan's Education System

There are three types of education system in Pakistan: Public, Private and Non-formal Educational Institutions. The formal education system broadly consists of early childhood education, primary education, middle education, secondary education, higher secondary education and higher education. Professional and practical skills are also developed through the implementation of technical and vocational education. Since the 18th Constitutional Amendment, the responsibility for education is shared between the federal and provincial governments with most of the education at the school level being managed by the provincial governments.

Table 2. Changes in Household Digital Access

Digital access indicator	2018–19 (%)	2024–25 (%)	Change (percentage points)
Households with internet access	34	70	+36
Households with computer/laptop/tablet	14	11	−3
Households with mobile/smartphone access	95	96	+1

The education system still has huge problems such as the lack of educational facilities, inequal accessibility to quality education, poverty, gender disparities, lack of teachers and large number of out-of-school children.

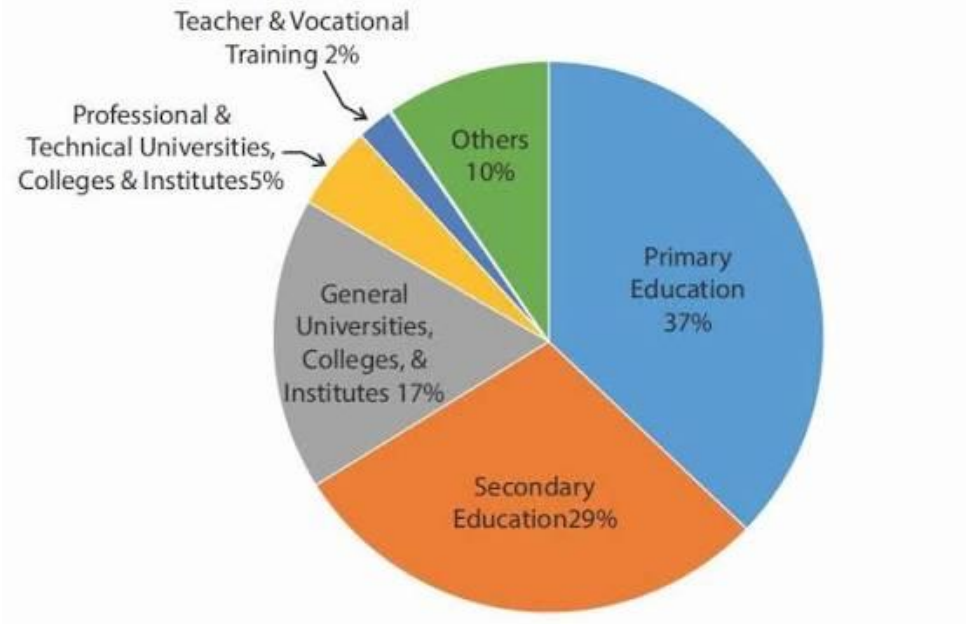

Fig 4.1 Overview of Pakistan's Education System

These problems are especially acute in underprivileged rural areas and less developed areas. Students from low income families are likely to face further challenges as their families are unable to afford private education, transport, internet connections and digital learning devices.

National Education Policies and Digital Education

Pakistan has formulated various policy measures for enhancing the access, quality and technological development of education. The policies serve as a basis on which to appreciate

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the government's efforts on the education reform and digital transformation.

The National Education Policy Framework 2018 highlighted the significant priorities to enhance the education sector, which also encompassed access, quality, governance and institutional performance. It highlighted the importance of providing better educational opportunities and enhancing national education system. Although the framework was not specifically formulated as a digital education policy, the goals set in it are more generally a basis for modernisation and the use of better learning materials.

Table 3. Individual Internet Usage by Gender and Location

Population group	Individuals using the internet (%)
Pakistan – Total	57
Male	57
Female	57
Urban population	69
Rural population	49

Another important development is Digital Pakistan Policy 2018. The policy, which was approved by the federal cabinet in May 2018, was to enhance the availability, affordability and reliability of information and communication technology services. It encouraged digital technologies for socioeconomic development and to enhance public services and access to digital opportunities. The goals are relevant to education because access to the Internet and digital infrastructure are critical for technology-based learning.

Table 4. Growth in Individual Internet Usage

Population group	2018–19 (%)	2024–25 (%)	Change (percentage points)
Pakistan – Total	17	57	+40
Male	21	57	+36
Female	13	57	+44

National Digital Education Initiatives in Pakistan

The Government of Pakistan has launched a number of programmes aimed at leveraging digital technology to facilitate educational purposes. These are designed to enhance access to learning resources, to support learning while there are interruptions, and to offer further learning opportunities to learners who are geographically or institutionally disadvantaged.

Table 5. Individual Mobile Phone Ownership

Population group	Mobile phone ownership (%)
Pakistan – Total	50
Male	69
Female	39
Urban population	58
Rural population	44

PTV TeleSchool is one of the key initiatives that was launched in 2020 during the COVID-19 pandemic. The school closures brought a sense of urgency around alternative learning arrangements. TeleSchool provided educational television content to the students from 1st to

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12th standards, English, Mathematics, Urdu and Science were the subjects. The project was designed to minimize disruptions to learning, especially for the students who were unable to attend regular school classes.

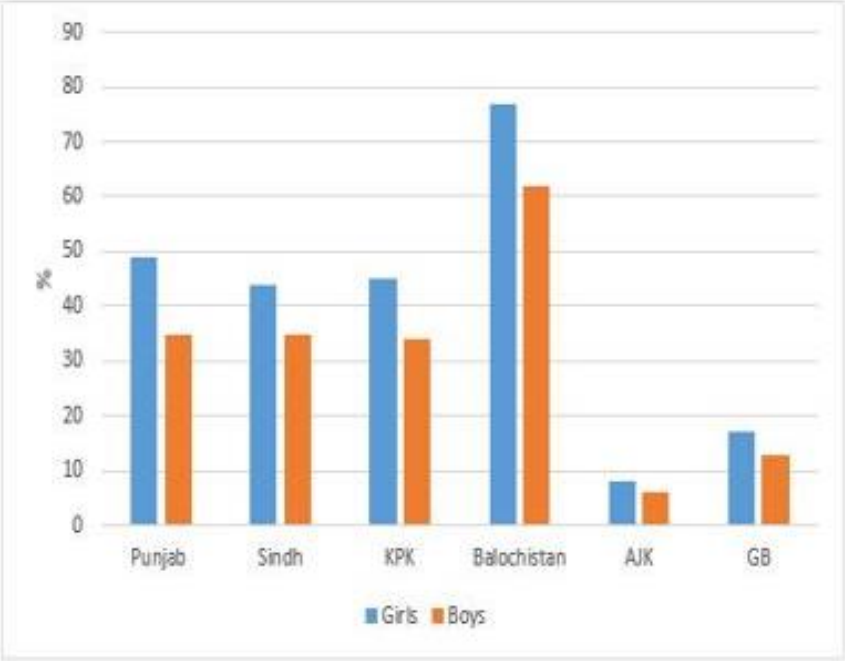

Fig 4.2 National Digital Education Initiatives in Pakistan

One of the other projects is the TeleSchool Mobile App launched in March 2023. The application offers six digital TV channels and a video-on-demand learning library, according to the Ministry of Federal Education and Professional Training. According to the Ministry, there were 63,750 users registered, with 9,171 being out-of-school children when it released details of the project. The numbers highlight some of the learners who have been reached outside of traditional schooling systems but it is important to note that these do not signify regular attendance or learning outcomes.

Table 6. Adult Literacy Rate by Gender and Location

Population group	Adult literacy rate (%)
Pakistan – Total	60
Male	71
Female	50
Urban population	73
Rural population	51

Another key digital education project is the eTaleem Portal. The portal was created initially to help in learning continuity during COVID and then extended to accommodate a Learning Management System and teacher training facilities. It delivers digital learning materials for school children and alternative learning for OOSC. The platform also has offline learning modules for remote regions like Azad Jammu and Kashmir and Gilgit-Baltistan, which might not have internet access.

The government has also installed smart classrooms and smart boards in some schools. The Ministry has published that 400 technology-driven smart classrooms have been

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set up in Islamabad Capital Territory, Azad Jammu and Kashmir, and Gilgit-Baltistan. Technological equipment including computers, interactive screens, speakers and other digital learning facilities are provided in these classrooms.

Role of the Ministry of Federal Education and Professional Training

The MoFE&PT is involved with the important areas of national educational coordination, policy formulation, educational standards and important national initiatives. Under the 18th Constitutional Amendment, the majority of the role of education was devolved to the provincial governments. The federal government, however, does continue to make contributions to interprovincial co-ordination, national educational priorities, and international educational commitments.

Table 7. Youth Literacy

Population group	Youth literacy rate (%)
Pakistan – Total	77
Male	82
Female	71
Urban population	85
Rural population	71

The Ministry plays a role in developing National education policies and also coordinates with the Provincial institutions using coordination forums e.g. Inter-Provincial Education Ministers' Conference. It also plays a role in education planning and gathering, standards creation, and supporting educational opportunities. It is responsible for the management of the federal educational institutions in Islamabad Capital Territory and coordination with relevant national organizations.

Table 8. Selected SDG 4 Indicators in Pakistan

SDG indicator	Description	Reported value
4.1.2	Primary education completion rate	70%
4.1.2	Lower secondary education completion rate	60%
4.1.2	Upper secondary education completion rate	30%
4.2.2	Participation in organized learning one year before primary entry age	29%
4.5.1	Gender parity index – literacy	0.74
4.5.1	Gender parity index – youth literacy	0.86
4.5.1	Gender parity index – primary education	0.96
4.5.1	Gender parity index – secondary education	0.91

Role of Provincial Governments in Digital Education

School education is primarily under the control of the provincial government which plays a major role in the implementation of educational policies. Under the 18th Constitutional Amendment, provinces now have more power in the fields of educational planning, educational management, curriculum, and service delivery. This enables the provincial governments to create programmes based on their educational priorities and needs in the region.

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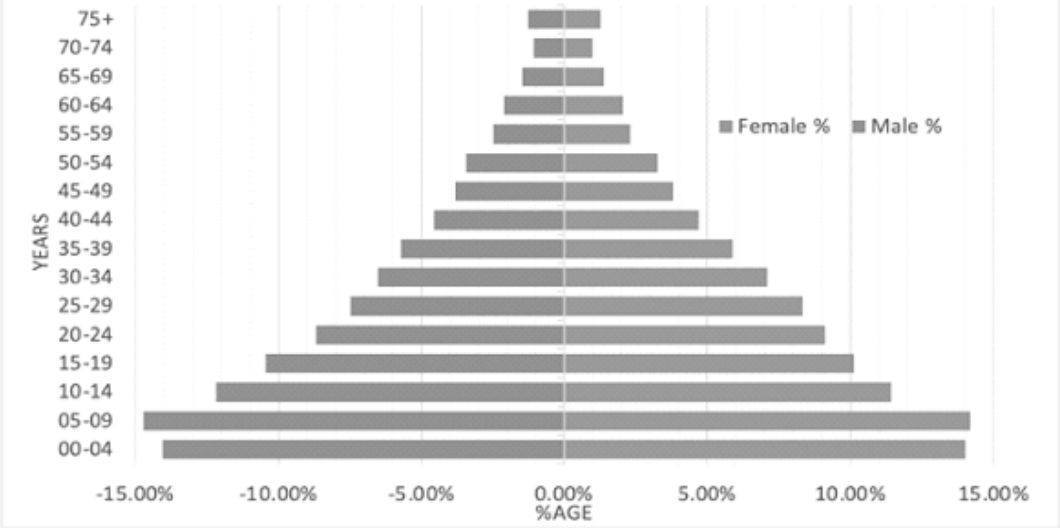

Fig 4.3 Role of Provincial Governments in Digital Education

Educational reforms and technology related initiatives have been implemented in different regions of Pakistan, including Punjab, Sindh, Khyber Pakhtunkhwa, and Balochistan. These include the development of digital learning content, online educational resources, technology-enriched learning, professional development of teachers, and enhancements to school infrastructure.

Technology has been used in the education sector to promote learning in Punjab, through the Taleem Ghar programme which supplied education content through television during school closures. The province has also worked on other school improvement and educational technology initiatives. But students from remote and low-income communities could still experience challenges in accessing the device and Internet connection to harness the benefits of distance learning.

Sindh has also initiated some educational reforms based on digital resources, school information systems and technology-based learning support. Furthermore, the diverse geographical and socio-economic makeup of the province demands varying implementation needs in urban areas, as compared with that of rural communities and remote districts.

KP has been engaged in education sector planning, school improvement, teacher development, and alternative education. These goals can be achieved using technology to enhance access to educational resources and enable communication between educational institutions and learners.

The geographical size, scattered population, remote settlements, and the lack of infrastructure in Balochistan makes it extremely difficult to address its situation. While digital learning can be used to serve students at remote locations, the absence of connectivity, electricity and institutional resources limit its use.

National Digital Literacy and Connectivity Initiatives

Internet connectivity, and literacy with digital tools, are crucial needs for digital education. Students should not only have access to digital devices, they should also have the skills to search for information, utilize educational devices, communicate electronically, assess digital content and complete technology based learning activities.

The Digital Pakistan Policy 2018 is a country-wide plan to promote digital services and enhance the access to information and communication technology. It aims to facilitate digital connectivity, enhance technological infrastructure and foster the use of digital

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services in various sectors. These priorities are important in relation to education because education relies on the availability of low cost and reliable Internet services.

The government has also played its part in facilitating the growth of mobile broadband services, as have the telecommunications sector. Mobile connectivity offers opportunities to students to access education via mobile devices. Yet Internet access on a cell phone may not be equivalent to Internet access on a computer or laptop, however, especially if the student must create assignments, attend online classes, or access educational software that requires them to be online.

CONCLUSION AND RECOMMENDATIONS

The general findings of the study titled 'Digital Inequality and Educational Equity in Pakistan: Critical assessment of policy implementation and progress towards SDG 4' is summarized in this chapter. It outlines the key findings of the study and gives recommendations to mitigate the issue of digital inequality and enhance educational opportunities in Pakistan. It investigates the differences in internet connectivity, digital devices, technological infrastructure, digital literacy, socioeconomic status and gender that affect access to educational opportunities. It also reviews national digital education policies and programs, and Pakistan's journey towards Sustainable Development Goal (SDG 4). The chapter points to the significance of digital education for all and the need for development of technology to be supported by effective policies, services, cheap services, sufficient infrastructure and equal opportunities for all students. It also highlights areas that need additional research to inform future education policy and research.

Summary of the Research

This study aimed at critically reviewing the digital inequality and educational equity in Pakistan, especially when it comes to policy implementation and progress towards SDG 4. The research examined the differences in learning opportunities between students from different socio-economic and geographical backgrounds when accessing the Internet and digital devices and technologies.

The design of the research was qualitative descriptive and analytical with the main method used was secondary data and policy document analysis. National education policies, government publications, academic research and reports from national and international organisations were used as a source of information. The study focused mainly on development events occurring in the period 2018-2026.

The study analyzed theoretical perspectives on what is meant by digital inequality and its key dimensions: Internet access, devices, digital literacy, socioeconomic disparities, gender inequalities, and urban-rural disparities. It also discussed the connection between digital inequality and educational equity, with a special emphasis on the developing world and Pakistan.

Results show that Pakistan has implemented various policies and programmes in the promotion of digital education, however, there is still unequal access to technological resources. Rural, low-income and disadvantaged students still have access challenges in using reliable Internet services, having appropriate digital devices and quality educational opportunities.

Major Findings

From the research it is concluded that there are some important findings related to digital inequality, educational equity and digital education policies in Pakistan.

Insufficient access to digital infrastructure

According to the study, access to digital infrastructure is still not equal in Pakistan. Lack of computers, computer sets, laptop computers, tablet computers, internet facilities and other technological resources in many educational institutions and homes. Pupils in urban areas tend to have greater access to digital learning facilities than pupils in remote rural areas.

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Large digital divide between urban and rural areas

The results show that there is geographical variation in access to digital education. According to the Household Integrated Economic Survey 2024-25 of the Pakistan Bureau of Statistics, the penetration of households with internet access is 82% in urban areas and 61% in rural areas. There was also a higher proportion of urban households than rural households that owned a computer, laptop or tablet. These disparities highlight the importance of specific investments in neglected communities.

Poverty and lack of affordability limit educational opportunities

Household income is identified as one of the factors affecting digital access by the study. Not all families have access to computers, smart phones, Internet and monthly data plans. This will likely result in interruptions to online learning and fewer opportunities for students from low-income families to access digital educational resources.

Gender inequality is an issue of digital inclusion.6. Digital inclusion is impacted by gender inequality

The study reveals that there might be further obstacles for girls accessing digital technologies. Girls are less likely to participate in digital learning due to household barriers, financial constraints, device access and access to education. Gender-sensitive policies are, therefore, essential for providing technology-based education to both men and women.

Pakistan has introduced important digital education initiatives

The study highlights some initiatives undertaken by the government to support the education sector such as Telecom School, Mobile Application 'TeleSchool', eTaleem Portal and smart classroom programmes. These are all examples of growing attention on technology as a means of enhancing educational access. But it takes regular usage, infrastructure, teacher engagement, and geographical coverage to make them effective.

There is need to raise awareness of digital literacy and teacher training

The results show that the use of technological equipment is not enough to ensure effective digital education. Digital skills for students are necessary in the use of the digital educational resources, digital skills for the teacher are necessary in the application of digital teaching. Educational technology programmes may be less effective due to limited digital competencies.

Implementation of policies is not uniform

The study pinpoints what has been different between the aims of the national policy and its implementation. The implementation of digital education is hindered by factors such as financial constraints, administrative deficiencies, and disparities between provinces and inadequate oversight. There needs to be greater collaboration and coordination between federal and provincial bodies.

Progress in the implementation of SDG 4 is a bit behind

While Pakistan has made efforts to increase access to education and promote learning through technology, there are still many obstacles to inclusive and equitable quality education. The availability of out-of-school children, gender gap, infrastructure gap, and access to technology reveal that more needs to be done to reach the education targets for 2030.

Conclusion

The findings of this study suggest that digital inequality is a serious issue in Pakistan that contributes to educational inequality. Digital technologies have brought new opportunities for learning but not for everyone. Students' use of technology-supported education is shaped by differences in internet access, digital devices owned, household income, geographical location, gender and digital literacy.

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The study shows that digital inequality is not a technical problem. It is closely linked to socio-economic conditions, education infrastructure, institutional capacity and social inequalities present. There are significant challenges for students from economically disadvantaged families and remote rural communities when it comes to access to digital learning resources compared with those from economically stronger, urban homes. Likewise, barriers faced by girls with regard to gender can further restrict educational opportunities for girls.

Pakistan has implemented various policies and initiatives aimed at fostering digital growth and enhancing educational opportunities.In order to encourage digital development in Pakistan and to increase access to education, the country has adopted several policies and initiatives. Important strides in this regard are the Digital Pakistan Policy 2018, TeleSchool, eTaleem Portal and the smart classroom programmes. But policies and digital platforms don't always lead to equal opportunities to learn. For them, it's all about how well it's implemented, funded, the Internet connection is available, the infrastructure is functional, and the teachers are trained.

The research further shows that digital education can play a role in reaching SDG 4 goals by increasing learning opportunities, providing better access to learning materials, facilitating teacher development, and access to remote communities. However, digital education needs to be embraced within a more comprehensive approach to educational quality, participation and social inclusion.

Technology expansion is not enough to achieve SDG 4 in Pakistan. It needs a wide-ranging commitment to make sure every student regardless of socio-economic, geographical and gender status has useful opportunities to access digital learning. Digital inequality should be minimised to enhance educational equity and promote an inclusive education system.

Policy Recommendations

The following recommendations are made on the basis of the conclusions from this research to overcome digital inequality, education equality and support Pakistan to advance towards SDG 4.

Improving Digital Infrastructure

Government should invest more in digital infrastructure in public educational institutions, specifically in remote and under-served areas. There should be adequate computer labs, laptop computers, tablets, internet facilities and digital equipment in schools.

Priority should be given to educational institutions that do not have basic technological facilities. Public-private partnerships could also be encouraged, to provide digital equipment and enhance technological infrastructure. Routine maintenance and replacement plans must be made to keep the digital facilities operating.

Ensuring affordable Internet access

Internet services should be made more affordable for students, teachers and educational institutions through collaboration between government and telecommunications companies and the Internet service providers.

Low-income families and students attending public schools and universities may be offered special educational Internet packages. Digital connectivity initiatives should be focused on rural populations and on areas where there is limited digital infrastructure.

The availability of broadband and mobile internet should be extended to more areas as well. In the absence of immediate internet connectivity, educational institutions should be encouraged to make offline digital learning materials, downloadable lessons and educational resources available locally.

These measures would contribute to bring down financial and geographical constraints to digital education.

Promoting Gender-Inclusive Digital Education

Gender equality should be seen as an integral part of each national digital education policy.

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Governments should establish programmes to provide equal access for girls to digital devices, Internet and technology-based educational resources.

The schools and educational institutions should create safe and supportive digital learning relationships for girls. Kinds of targeted initiatives may encompass subsidized devices, digital literacy programmes for girls, scholarships and technological training in the community.

Families and communities should also be made aware of the importance of their support for girls' involvement in digital education through awareness programmes. Special efforts should be made to provide opportunities for rural and economically marginalized communities in which girls might encounter multiple impediments to enjoying the right to education.

Female educators and community groups can also help in the rollout of gender-sensitive digital learning programmes.

Reducing the educational disparities between urban and rural students.

The Government should develop specific measures to minimize the gap in digital education opportunities between urban and rural areas. Computers, Internet facilities, electricity infrastructure, digital learning materials, etc. should be given priority to rural schools.

Programmes on educational technology should be developed in response to the local conditions. Offline learning platforms, community learning centres, educational television, preloaded digital content and community learning centres can offer alternative learning platforms in remote communities with limited internet connectivity.

Along with this, the provincial government should also determine the educational and technological disadvantageous districts and provide adequate resources keeping these factors in mind.

A geographical strategy would enable digital education programmes to be delivered to disadvantaged communities rather than be confined to the big cities.

Enhancing Digital Literacy and Teacher Education

Digital literacy needs to be incorporated into planning for primary, secondary, and higher education. Students need to be given hands-on experience in how computers are used, how to search the internet, using online communication tools, digital safety and the responsible use of digital educational tools.

Teachers should have opportunities on a regular basis to develop their technological skills through professional development. The emphasis of training programmes should be on the use of digital platforms, the preparation of digital learning resources, technology-supported lessons, and the assessment of learners' performance using digital tools.

There should be partnerships among provincial education departments and teacher training institutions to create appropriate training programmes. Teacher support and assistance should also be offered on an on-going basis to help them effectively use digital equipment.

The enhancement of digital literacy among both students and teachers will enhance the quality and usefulness of education supported by technology.

Strengthening implementation and monitoring of policies

The government needs to reinforce the execution and supervision of national policies for digital education. For all large-scale digital education projects, clear responsibilities, implementation timelines, financial arrangements, and measurable results should be defined.

Federal/Provincial governments should increase coordination to avoid duplication and ensure that digital education programmes fulfil the educational needs in the region. The following should be evaluated regularly through monitoring: Number of schools with digital facilities that are functioning, availability of Internet, student participation, teacher

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training, and results on the use of digital tools in education.

A national digital education monitoring framework which is accessible should be established that gives up-to-date information on progress and implementation issues. To spot strengths and weaknesses, and make recommendations for improvement, independent evaluations should be done.

Importantly, the impact on education should be measured through actual education benefits and not just the number of devices handed out, classrooms set up, or students enrolled on digital platforms.

Strengthening Pakistan's Commitment to SDG 4 (Quality Education)

Pakistan should enhance its efforts towards SDG 4 by incorporating digital inclusion in the country's and province's educational planning agendas. Digital education policies need not to be considered as one set of technological programs, but rather in the context of broader inclusive and equitable quality education goals.

The government should focus on providing access to education to OOSC, girls, students with disabilities, low-income families and communities in remote areas. In addition to efforts to enhance school infrastructure and basic literacy rates, teacher capacity building, and educational participation, the benefits of digital learning opportunities should be leveraged.

Progress towards SDG 4 targets and indicators should be regularly monitored at the federal and provincial levels. Accurate and unambiguous educational information should be gathered and disseminated to inform evidence-based policy decisions.

Pakistan must further support joint efforts with UNESCO, UNICEF, World Bank and other development partners for technical support to enhance educational planning, and assist in sustainable digital learning initiatives in the country.

SDG 4 will take time and a substantial investment in resources, institutional coordination and equal opportunities for all learners.

Future Research Directions

- While this study is a critical analysis of digital inequality and educational equity in Pakistan, there is a need for more research-based knowledge and understanding of this issue.
- Future research may examine this relationship quantitatively by measuring household income, Internet access, ownership of digital devices and students' educational performance. Students, teachers, and parents might also be involved in surveys that yield more evidence on the challenges faced in practice by the various population groups.
- It would also be useful to do a comparative study of Punjab, Sindh, KP and Balochistan. Possible differences in digital infrastructure, provincial policies, teacher training, and the availability of technology-supported educational resources could be assessed through such studies.
- There is need to explore gender-based digital inequality, especially the challenges faced by women learners in rural and deprived communities in the future. Research could also explore the impact of digital access on girls' engagement, educational outcomes and higher education opportunities.
- The effectiveness of the implementation of specific digital education programmes, such as TeleSchool, the eTaleem portal and smart classroom programmes, is another key research focus. Further studies might be conducted on student participation, student learning, geographical coverage, and long-term sustainability of such programmes.
- Studies on the preparedness of teachers and the digital literacy of teachers are also required. Research could examine teachers' technological skills, training needs, and experiences with implementing digital resources in teaching.

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