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DIGITAL DIVIDE AND ITS IMPACT ON ACCESS TO QUALITY EDUCATION IN RURAL AREAS OF JALPAIGURI DISTRICT, WEST BENGAL, INDIA

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Abstract

The rapid expansion of Information and Communication Technology (ICT) has transformed the global education system by improving access to knowledge, digital learning platforms, and interactive pedagogical methods. However, the unequal distribution of digital resources has created a significant "digital divide," especially in rural regions of developing countries like India. This study examines the digital divide and its impact on access to quality education in the rural areas of Jalpaiguri District. The research investigates disparities in internet connectivity, digital device ownership, digital literacy, and online educational accessibility among rural students. The study is based on both primary and secondary data collected from villages, schools, government reports, census data, journal articles, and educational surveys. The findings reveal that socio-economic inequality, inadequate infrastructure, unstable electricity, low parental awareness, and poor digital literacy significantly restrict rural students' educational opportunities. The study further demonstrates that the digital divide contributes to academic inequality, increased dropout risks, limited access to e-learning resources, and reduced participation in modern educational systems. The paper suggests policy interventions including rural digital infrastructure development, subsidized internet services, digital literacy campaigns, teacher training, and community-based smart learning centers. Bridging the digital divide is essential for ensuring equitable and inclusive education in rural Jalpaiguri and for achieving sustainable educational development in India.

Keywords: Digital Divide, Rural Education, ICT, Educational Inequality, Jalpaiguri District, Digital Literacy, Online Learning, Quality Education

1. Introduction

The twenty-first century global knowledge economy has rendered Information and Communication Technology (ICT) not merely a convenience but an existential necessity for equitable participation in educational, economic, and civic life. While urban centres in India have witnessed exponential growth in digital connectivity, vast swathes of rural hinterland continue to lag behind — a phenomenon widely conceptualised as the 'digital divide' (Warschauer, 2004; van Dijk, 2006). This chasm is not merely about the absence of gadgets; it encompasses differential access to reliable electricity, broadband infrastructure, culturally relevant digital content, and the pedagogical capacity to harness technology for meaningful learning (UNESCO, 2023). Jalpaiguri district in the sub-Himalayan Terai–Dooars belt of North Bengal offers a uniquely illustrative context. Covering an area of approximately 6,227 sq. km with a population of 3.87 million (Census of India, 2011), the district is characterised by dense tea plantation communities, indigenous tribal populations (Rajbanshi, Mech, Oraon, Santali), migrant labour households, and forested terrain that renders conventional infrastructure development prohibitively costly. The district's Human Development Index (0.538) remains substantially below the state average (0.641), and literacy rates in blocks such as Matiali, Nagrakata, and Mal hover around 57–62%, compared to the state average of 76.3%.

Against this backdrop, the COVID-19 pandemic of 2020–22 served as a brutal stress test of digital educational infrastructure. The nationwide shift to online learning exposed, with stark clarity, the educational cost of the digital divide: hundreds of thousands of rural children in districts like Jalpaiguri were effectively locked out of education for extended periods (ASER, 2022). While emergency measures provided some relief, they also underscored the systemic, structural nature of the problem. The present study is therefore animated by an urgent empirical and policy imperative: to rigorously measure the dimensions of the digital divide in rural Jalpaiguri, to establish its causal pathways to educational quality deficits, and to formulate actionable, context-specific recommendations. It contributes to the growing scholarly literature on ICT and educational equity in the Global South (Warschauer & Matuchniak, 2010; Selwyn, 2016; Sinha & Mishra, 2021) while producing locally grounded evidence essential for district-level planning.

2. Statement of the Problem

Despite significant investments under the National Mission on Education through ICT (NMEICT), PM eVIDYA, and state-level initiatives such as Kanyashree and Sabuj Sathi, the penetration of meaningful digital education infrastructure in rural Jalpaiguri remains critically inadequate. The problem is characterised by several interrelated dimensions:

- Infrastructure Deficit: The majority of government-aided and government primary and secondary schools lack functional computer laboratories, stable electricity supply, and internet connectivity, leaving students and teachers unable to access digital learning resources.
- Socio-economic Barriers: Extreme poverty, seasonal agricultural employment cycles, and the plantation wage economy constrain household capacity to invest in digital devices or data subscriptions, creating a sharp intra-district divide between tea-garden communities and other rural populations.
- Pedagogical Unpreparedness: Even where hardware exists, inadequate pre-service and in-service teacher training in ICT-integrated pedagogy renders the infrastructure educationally ineffective.
- Geographical Isolation: Hilly terrain, forest cover, and dispersed settlements result in poor mobile network coverage across large portions of the district, exacerbating connectivity deficits.
- Content and Language Mismatch: The preponderance of digital educational content in English or standard Bengali is ill-suited to the multilingual contexts of tribal and plantation communities in the district.

These intersecting barriers raise the central research problem: How does the digital divide — in its multiple infrastructural, economic, social, and pedagogical dimensions — affect the quality of and access to education for rural children in Jalpaiguri district, and what interventions can most effectively bridge this divide?

3. Objectives of the Study

The study is guided by the following specific objectives:

1. To assess the current status of digital infrastructure — including hardware, connectivity, and electricity — across schools and households in rural blocks of Jalpaiguri district.
2. To measure the levels of digital literacy among students and ICT competency among teachers in the district's rural schools.
3. To examine the relationship between ICT access and key educational outcome indicators, including academic performance, dropout rates, and higher education enrolment.

4. Review of Literature

4.1 Conceptualising the Digital Divide

The concept of the digital divide was first popularised in the late 1990s in United States policy discourse (NTIA, 1999) and has since evolved into a sophisticated multi-dimensional framework. Van Dijk (2006) identified four successive access barriers: motivational access, physical access, skills access, and usage access — a hierarchy that has proven remarkably applicable to contexts in the Global South. Warschauer (2004) critiqued purely device-centred conceptions, arguing for a social embedding framework in which meaningful ICT access requires not just hardware but social support, quality content, and integration into purposive activities.

In the Indian context, the digital divide intersects with pre-existing social stratifications of caste, class, gender, and geography (Sinha & Mishra, 2021). The National Sample Survey (2017–18) documented that only 24% of Indian rural households possessed internet access, compared to 66% in urban areas. More recent data from TRAI (2024) indicates that while teledensity has improved, rural broadband quality remains significantly inferior, with high latency and frequent outages impeding educational use.

4.2 ICT and Educational Outcomes

The empirical literature on ICT's impact on learning outcomes is rich but nuanced. Meta-analyses (Tamim et al., 2011; Higgins et al., 2012) confirm that technology integration, when pedagogically purposive, can yield effect sizes in the range of 0.3–0.4 standard deviations on academic performance. However, these effects are contingent on teacher competency, content relevance, and infrastructure reliability — conditions often absent in rural India.

Studies focusing on North and Northeast India (Bhattacharya & Bhattacharya, 2019; Dey, 2020) document that schools with functional ICT infrastructure demonstrate higher enrolment retention, better examination results, and improved teacher accountability. Conversely, schools with dysfunctional or absent technology show minimal gains from nominal hardware provision — often described as 'digital decoration' (Jhurree, 2005).

4.3 The Rural Educational Context in West Bengal

West Bengal's educational landscape presents a complex picture. While the state achieved near-universal primary enrolment by 2015, quality indicators — measured by ASER foundational learning assessments — show persistent deficits, particularly in rural districts. The Annual Status of Education Report (ASER, 2022) recorded that in rural West Bengal, only 41.7% of Grade 5 students could read a Grade 2 text, and only 25.9% could perform simple division. Jalpaiguri's figures are consistently below even these state averages.

The Sabuj Sathi scheme (2015) provided bicycles to secondary students to address mobility barriers, while the Kanyashree programme incentivised girls' enrolment. However, focused digital equity interventions specifically targeting rural connectivity and school ICT infrastructure have been limited and unevenly implemented, creating significant gaps in the policy landscape that the present study seeks to document.

5. Research Methodology

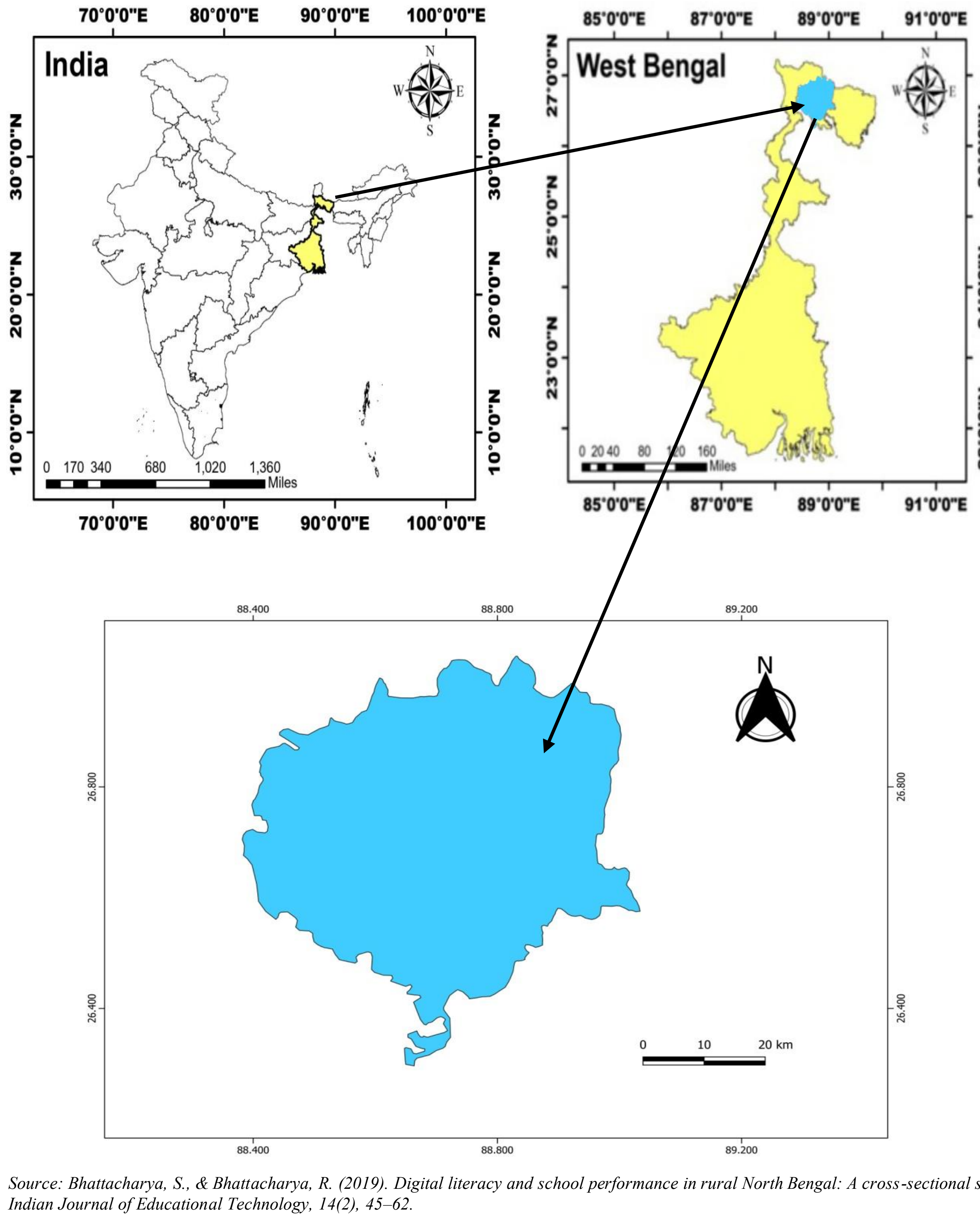
5.1 Research Design

This study employs a Mixed-Methods Sequential Explanatory Design (Creswell & Plano Clark, 2018), in which quantitative data collection and analysis precede and inform qualitative inquiry. The quantitative phase establishes the magnitude and correlates of the digital divide and its educational impacts, while the qualitative phase explains and contextualises statistical patterns through participant voices and institutional ethnography.

5.2 Study Area

The study covers all eight administrative blocks of Jalpaiguri district: Jalpaiguri Sadar, Maynaguri, Dhupguri, Mal, Nagrakata, Rajganj, Matiali, and Malbazar. The selection encompasses diverse ecological (plains, hilly, and forested), economic (agricultural, plantation, and service), and demographic (tribal, Bengali, Rajbanshi, and migrant) sub-contexts, ensuring representativeness.

Location Map



Source: Bhattacharya, S., & Bhattacharya, R. (2019). Digital literacy and school performance in rural North Bengal: A cross-sectional study. Indian Journal of Educational Technology, 14(2), 45–62.

5.3 Sample and Sampling Strategy

A multi-stage stratified random sampling technique was employed. In Stage 1, two CD Blocks from each of four agro-ecological zones were selected. In Stage 2, five schools per block (40 schools total) were randomly selected from the district school register. In Stage 3, 420 students (Classes VI–X, 10–11 per school), 210 teachers (5–6 per school), and 180 household respondents (parents/guardians from sampled students' households) were systematically selected. For the qualitative phase, purposive sampling was used to select 32 in-depth interview respondents (12 headmasters/principals, 10 Block Education Officers, 10 community leaders) and 8 focus group discussions with teachers, students, and parents, balanced across blocks.

5.4 Data Collection Instruments

- Structured Student Schedule: 48 items covering socio-demographic profile, device ownership, internet access, digital skills self-assessment, and academic performance (class average marks).
- Teacher ICT Competency Scale: 30-item Likert-scale instrument adapted from UNESCO ICT Competency Framework (UNESCO, 2018), covering basic ICT operations, digital pedagogy, and collaborative digital practice. Cronbach's alpha = 0.87.
- School Infrastructure Checklist: Physical verification inventory for hardware, connectivity, electricity, and digital content availability.
- Household Digital Access Schedule: 35-item instrument covering device ownership, monthly data expenditure, awareness of digital schemes, and children's home-based digital study habits.
- In-depth Interview Guide and FGD Protocol: Semi-structured guides covering perceptions of technology's educational role, experiences of barriers, and suggestions for improvement.

5.5 Data Analysis

Quantitative data were coded and analysed using IBM SPSS Statistics 27.0. Descriptive statistics (means, SDs, frequencies, percentages) characterised the digital divide dimensions and educational outcomes. A composite ICT Infrastructure Index (0–100) was constructed through normalised weighted summation of six sub-indices: hardware availability (25%), internet connectivity (25%), electricity reliability (20%), teacher ICT competency (15%), digital content availability (10%), and technical support access (5%). Multiple Ordinary Least Squares (OLS) regression was used to model

Academic Performance Index as a function of ICT and socio-economic predictors. Pearson and Spearman correlations examined bivariate associations. Qualitative data were transcribed, member-checked, and subjected to thematic analysis (Braun & Clarke, 2006), with NVivo 12 supporting coding and pattern identification.

5.6 Ethical Considerations

Institutional ethical clearance was obtained from the University of North Bengal Ethics Committee (Ref: NBU/ED/EC/2025/047). Written informed consent was secured from adult participants and parental/guardian consent for minors. Anonymity and confidentiality were maintained throughout. No incentives were provided, and participation was entirely voluntary. Data are stored in password-protected institutional repositories.

6. Data Analysis and Results

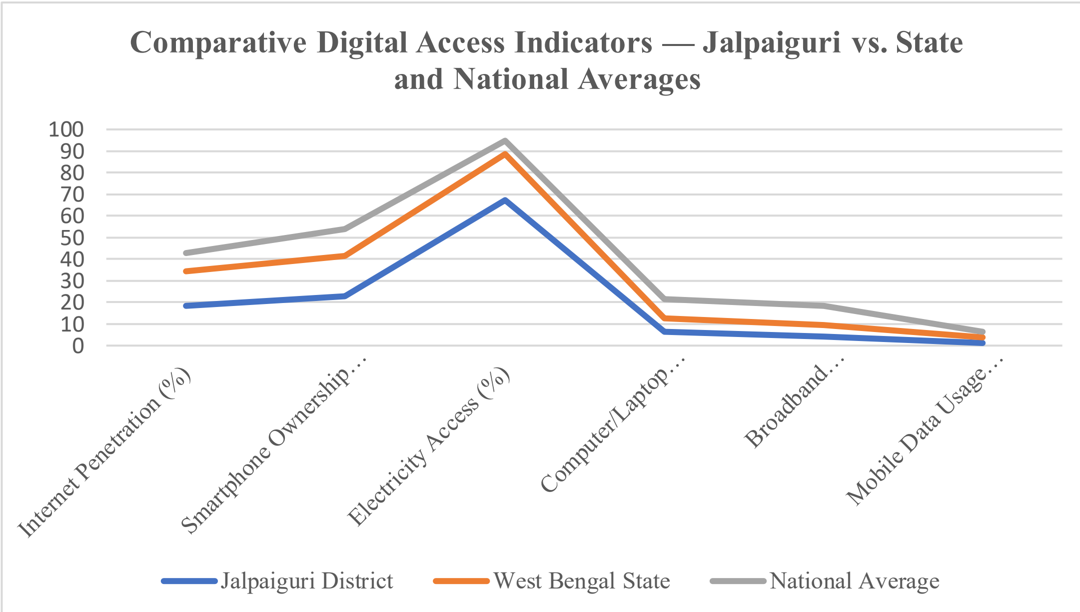
6.1 Digital Infrastructure Status: District Profile

Table 1 presents a comparative snapshot of key digital access indicators for Jalpaiguri district against state and national benchmarks. The contrast is stark: at 18.4%, district internet penetration is less than half the national average of 43.0% and barely more than half the state average.

Table 1: Comparative Digital Access Indicators — Jalpaiguri vs. State and National Averages (2024–25)

Indicator	Jalpaiguri District	West Bengal State	National Average
Internet Penetration (%)	18.4	34.2	43.0
Smartphone Ownership (%)	22.7	41.5	54.0
Electricity Access (%)	67.3	88.6	94.8
Computer/Laptop Ownership (%)	6.2	12.8	21.3
Broadband Connectivity (%)	4.1	9.7	18.5
Mobile Data Usage (GB/month)	1.2	3.8	6.4

Source: Primary field survey (2025); TRAI Annual Report (2024); NSSO ICT Survey (2023–24); National Family Health Survey-5 (2021)



Smartphone ownership, critical for mobile learning in the absence of computers, stands at 22.7% — approximately 40 percentage points below the national figure. The electricity access gap (67.3% vs. 94.8% nationally) is particularly consequential, as unreliable power supply undermines even the limited ICT infrastructure that exists.

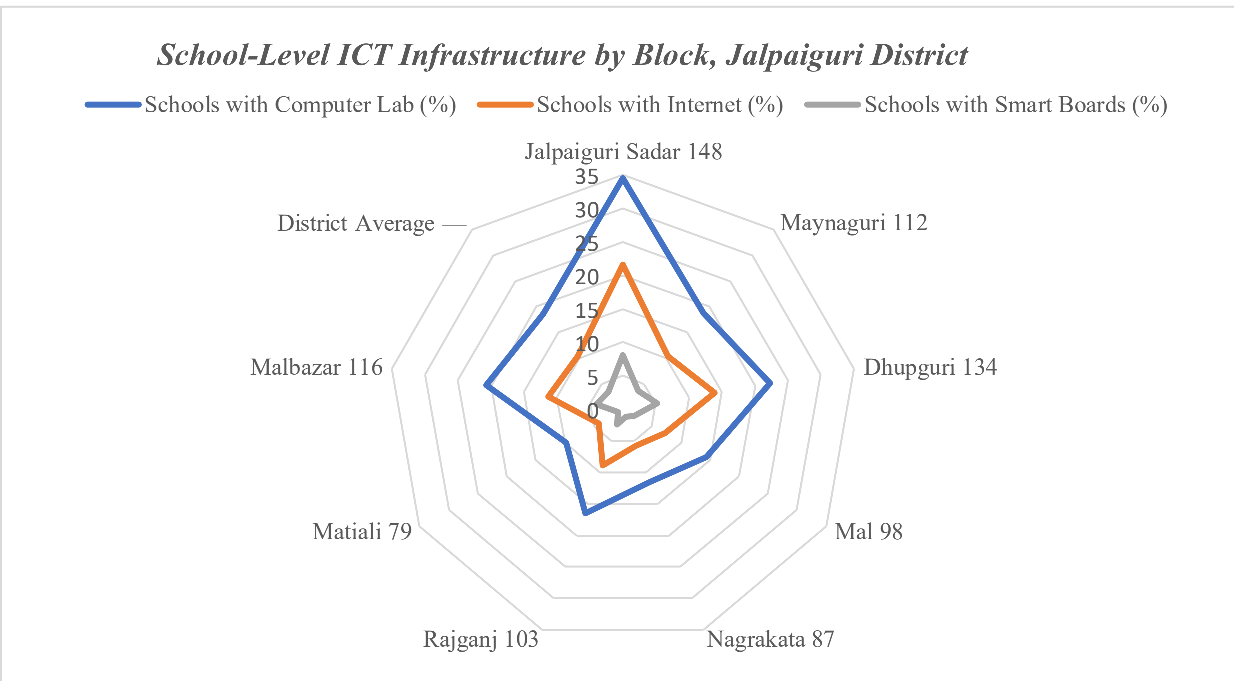
6.2 School-Level ICT Infrastructure Across Blocks

Table 2 disaggregates school-level ICT infrastructure across the eight blocks of the district. The inter-block variation reveals a pronounced spatial gradient: schools in Jalpaiguri Sadar (the district headquarters) demonstrate comparatively better access, while remote blocks such as Matiali (9.8% with computer labs, 4.1% with internet), Nagrakata (11.5%, 5.7%), and Mal (14.3%, 7.2%) display near-complete digital infrastructure absence. The district average of 18.6% computer lab coverage and 10.4% internet connectivity represent a massive infrastructure deficit for a district serving over 877,000 school-age children.

Table 2: School-Level ICT Infrastructure by Block, Jalpaiguri District (2024–25)

Block/Area	Total Schools	Schools with Computer Lab (%)	Schools with Internet (%)	Schools with Smart Boards (%)
Jalpaiguri Sadar	148	34.5	21.6	8.1
Maynaguri	112	18.7	10.4	3.6
Dhupguri	134	22.3	13.9	5.2
Mal	98	14.3	7.2	2.0
Nagrakata	87	11.5	5.7	1.1
Rajganj	103	16.5	8.9	2.4
Matiali	79	9.8	4.1	0.8
Malbazar	116	20.7	11.3	4.0
District Average	—	18.6	10.4	3.4

Source: Primary school infrastructure census (n = 877 schools), District School Register, DISE 2024–25



6.3 Descriptive Statistics of Key Study Variables

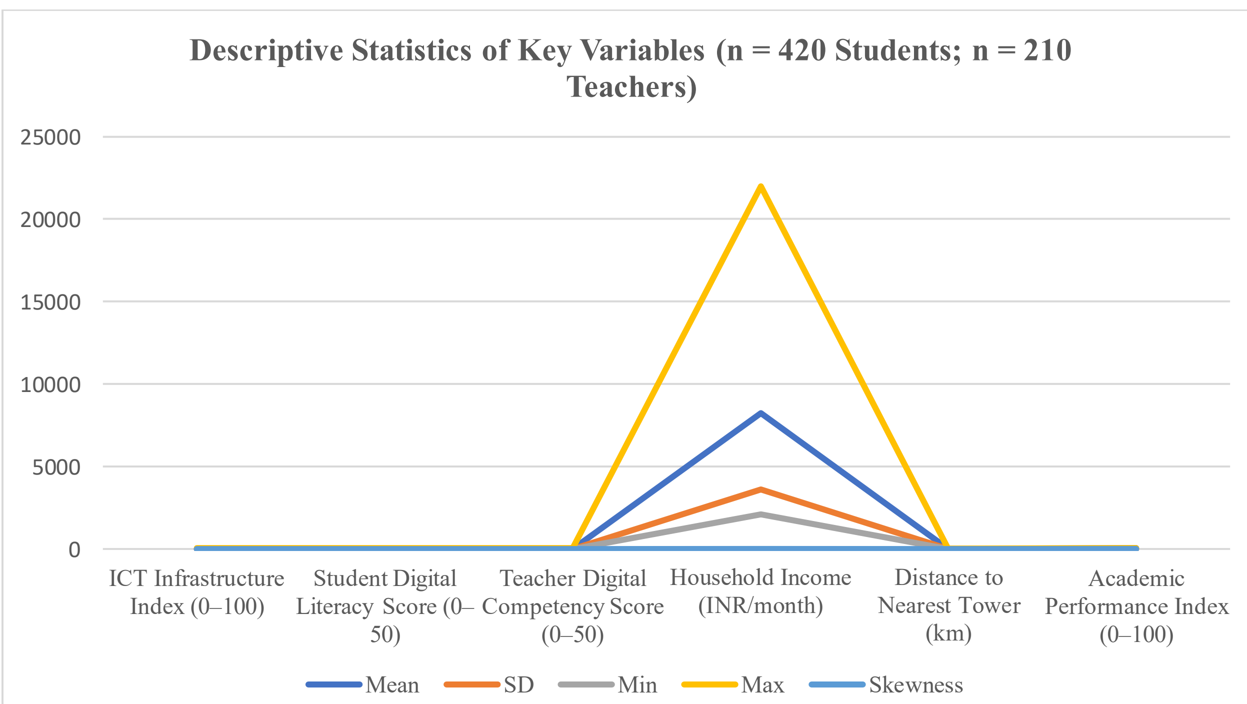
Table 3 presents descriptive statistics for the primary quantitative variables in the study. The ICT Infrastructure Index mean of 22.4 (out of 100) with a standard deviation of 8.7 underscores the severity of the infrastructure deficit while also highlighting considerable within-district variation.

Student digital literacy scores averaging 14.3 out of 50 and teacher ICT competency scores of 17.6 out of 50 confirm critical gaps in human capital alongside the infrastructure gap. The mean household income of INR 8,240 per month and average distance to the nearest mobile tower of 8.6 km contextualise the structural constraints. The Academic Performance Index mean of 47.8 (out of 100) reflects the overall low academic attainment and its potential linkage to digital access deficits.

Table 3: Descriptive Statistics of Key Variables (n = 420 Students; n = 210 Teachers)

Variable	Mean	SD	Min	Max	Skewness
ICT Infrastructure Index (0–100)	22.4	8.7	6.0	48.0	0.82
Student Digital Literacy Score (0–50)	14.3	5.2	4.0	36.0	0.61
Teacher Digital Competency Score (0–50)	17.6	6.1	5.0	40.0	0.44
Household Income (INR/month)	8,240	3,610	2,100	22,000	1.12
Distance to Nearest Tower (km)	8.6	4.3	0.5	24.0	0.73
Academic Performance Index (0–100)	47.8	12.3	18.0	81.0	0.29

Source: Primary field survey (2025); SD = Standard Deviation



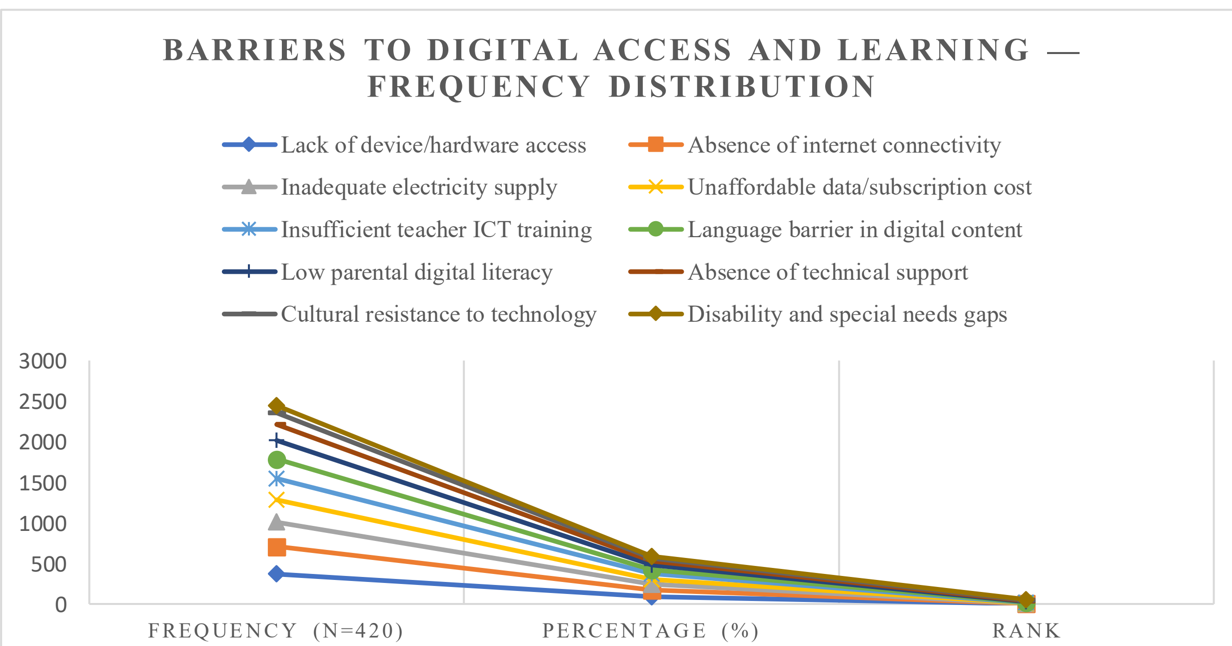
6.4 Barriers to Digital Access: Frequency Analysis

Respondents were asked to identify the barriers that most significantly impede their digital access and digital learning. Table 4 ranks the ten identified barriers by frequency. Hardware unavailability (87.6%) and internet absence (81.2%) emerge as the most pervasive barriers, confirming the infrastructure-first nature of the divide.

Table 4: Barriers to Digital Access and Learning — Frequency Distribution (n = 420)

Barrier Category	Frequency (n=420)	Percentage (%)	Rank
Lack of device/hardware access	368	87.6	1
Absence of internet connectivity	341	81.2	2
Inadequate electricity supply	298	71.0	3
Unaffordable data/subscription cost	276	65.7	4
Insufficient teacher ICT training	263	62.6	5
Language barrier in digital content	241	57.4	6
Low parental digital literacy	228	54.3	7
Absence of technical support	197	46.9	8
Cultural resistance to technology	143	34.0	9
Disability and special needs gaps	89	21.2	10

Source: Primary field survey (2025); Multiple responses permitted; Ranked by frequency



However, the high ranking of unaffordable data costs (65.7%), insufficient teacher training (62.6%), and language barriers (57.4%) signal that even if connectivity infrastructure were addressed, economic and pedagogical barriers would continue to impede educational access, underscoring the need for multi-pronged policy responses.

6.5 Multiple Regression Analysis: Predictors of Academic Performance

An OLS multiple regression analysis was conducted with Academic Performance Index (API) as the dependent variable and seven independent variables representing ICT, socio-economic, and geographic dimensions. Table 5 presents the regression coefficients. The model is statistically significant ($F(7, 412) = 94.27$, $p < 0.001$) with an adjusted R^2 of 0.617, indicating that approximately 61.7% of the variance in academic performance is explained by the included predictors. Multicollinearity diagnostics (VIF < 3.2 for all variables) confirm model stability. Durbin–Watson statistic (1.89) indicates no significant autocorrelation.

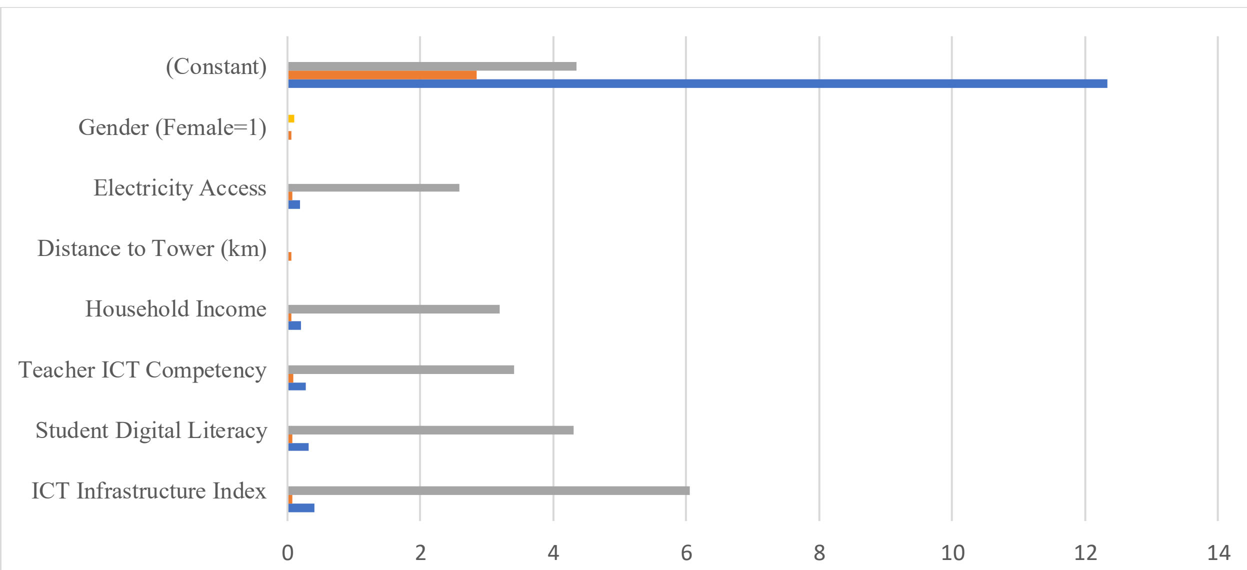
The ICT Infrastructure Index registers the strongest positive effect ($\beta = 0.412$, $p < 0.001$): a one-unit increase in the index is associated with a 0.41-point increase in API, holding other variables constant. Student digital literacy ($\beta = 0.318$) and teacher ICT competency ($\beta = 0.276$) are also highly significant positive predictors, confirming that infrastructure provision must be accompanied by investment in human capacities. Distance to the nearest mobile tower exerts the strongest negative effect among the predictors ($\beta = -0.224$, $p < 0.001$), with each additional kilometre of distance associated with a 0.22-point reduction in API — quantifying the tangible educational cost of geographical connectivity exclusion. Gender, while showing a negative coefficient for females ($\beta = -0.094$), does not reach statistical significance ($p = 0.106$), suggesting that, once structural access factors are controlled for, gender per se is not a significant independent predictor in this district context.

Table 5: OLS Regression — Predictors of Academic Performance Index (Dependent Variable: API)

Predictor Variable	β Coefficient	Std. Error	t-value	p-value	Significance
ICT Infrastructure Index	0.412	0.068	6.06	< 0.001	***
Student Digital Literacy	0.318	0.074	4.30	< 0.001	***
Teacher ICT Competency	0.276	0.081	3.41	0.001	**
Household Income	0.198	0.062	3.19	0.002	**
Distance to Tower (km)	−0.224	0.057	−3.93	< 0.001	***
Electricity Access	0.183	0.071	2.58	0.010	*
Gender (Female=1)	−0.094	0.058	−1.62	0.106	ns
(Constant)	12.340	2.840	4.35	< 0.001	***

*Source: Primary field survey (2025); *** p < 0.001; ** p < 0.01; * p < 0.05; ns = not significant*

Model Fit: $F(7, 412) = 94.27$, $p < 0.001$; Adjusted $R^2 = 0.617$; Durbin–Watson = 1.89



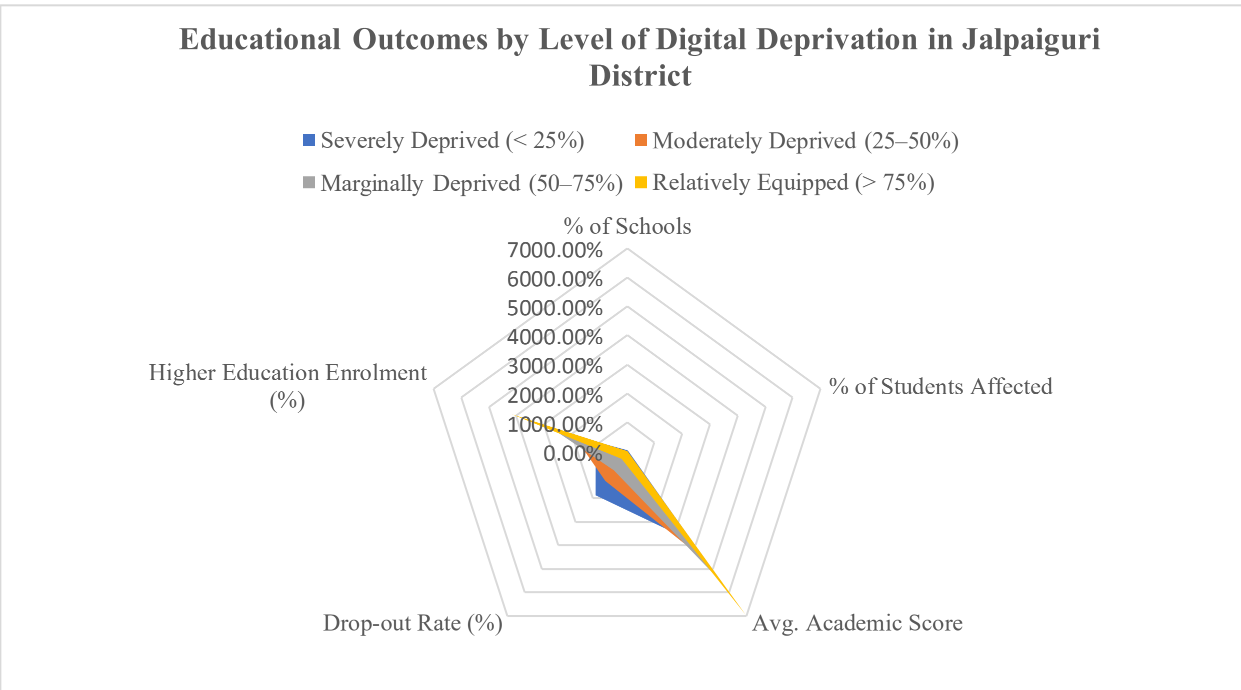
6.6 Educational Outcomes by Level of Digital Deprivation

To directly compare educational outcomes across digital deprivation strata, schools were classified into four groups based on their ICT Infrastructure Index scores. Table 6 reveals a deeply alarming pattern: schools classified as 'severely deprived' (42.3% of all district schools) not only exhibit the lowest academic scores (38.2) but also the highest dropout rates (18.4%) and the lowest higher education enrolment rates (11.2%). The gradient across all three outcome indicators is monotonic and steep, providing powerful evidence of the causal pathway from digital deprivation to educational disadvantage.

Table 6: Educational Outcomes by Level of Digital Deprivation in Jalpaiguri District

Category	Severely Deprived (< 25%)	Moderately Deprived (25–50%)	Marginally Deprived (50–75%)	Relatively Equipped (> 75%)
% of Schools	42.3%	31.7%	18.6%	7.4%
% of Students Affected	53.8%	28.4%	13.1%	4.7%
Avg. Academic Score	38.2	46.7	56.3	69.4
Drop-out Rate (%)	18.4	12.6	7.8	3.2
Higher Education Enrolment (%)	11.2	19.6	28.4	41.7

Source: Primary field survey and DISE 2024–25; ICT deprivation classification based on composite ICT Infrastructure Index



6.7 Qualitative Findings: Voices from the Field

Thematic analysis of 32 in-depth interviews and 8 FGDs generated four primary themes that illuminate the quantitative patterns with lived experience:

Theme 1: 'The Computer Collects Dust' — Infrastructure Without Pedagogy

Multiple headmasters reported receiving computer hardware under government schemes but lacking the connectivity, maintenance support, or teacher capacity to operationalise it. A headmaster in Matiali block articulated: 'We got twelve computers three years ago. The generator failed after six months. Since then, the room is locked. The children have never touched them.' This 'digital decoration' phenomenon (Jhurree, 2005) was reported in 14 of 40 sampled schools.

Theme 2: The Economics of Exclusion

For tea-garden and small-farmer households, the cost of data connectivity represents a significant proportion of daily income. Parents in FGDs in Mal and Nagrakata blocks consistently reported that purchasing a data recharge of INR 199 (approximately USD 2.40) for a month felt 'like a luxury, not a necessity' when competing with food and school supplies. The intergenerational dimension was stark: parents with limited digital literacy could not guide children's digital learning even when devices were provisionally available.

Theme 3: Teachers as Reluctant Intermediaries

Teachers expressed a complex mix of aspiration and anxiety regarding ICT integration. Many reported receiving single-day ICT orientation workshops that were inadequate for building instructional competency. A recurring sentiment: 'We want to use technology, but we are afraid to break something or show our ignorance in front of students.' Women teachers in particular noted a double exclusion — limited prior digital exposure at home combined with institutional environments that did not prioritise their capacity building.

Theme 4: Language as a Digital Barrier

Tribal communities (Mech, Oraon, Santali) and Nepali-speaking households reported that available digital educational content — whether on government portals like DIKSHA or on YouTube — was predominantly in English or standard Bengali, making it inaccessible to students whose mother tongue is neither. This content language mismatch effectively excluded a significant segment of the district's most marginalised learners from digital education benefits.

7. Discussion

The findings of this study converge on a clear and troubling conclusion: the digital divide in rural Jalpaiguri is not a peripheral inconvenience but a structural mechanism for educational reproduction of inequality. The regression results (Adjusted $R^2 = 0.617$) confirm that digital access parameters collectively explain more than three-fifths of the variance in academic outcomes — a substantially higher explanatory power than typically found in urban-rural comparisons, suggesting that in resource-depleted contexts like rural Jalpaiguri, digital access becomes the decisive margin.

The identification of distance to mobile tower ($\beta = -0.224$) as a significant predictor is theoretically important: it operationalises geographical exclusion as a quantifiable educational cost, challenging policy frameworks that treat connectivity as a uniform national metric while ignoring sub-district spatial granularity. The finding that 42.3% of district schools fall in the 'severely deprived' category, with an average academic score of 38.2 against 69.4 in relatively equipped schools — a gap of over 30 percentile points — is arguably the most alarming single finding of the study. The qualitative evidence on the 'digital decoration' phenomenon aligns with global scholarship (Jhurree, 2005; Selwyn, 2016) and adds an important local dimension: in Jalpaiguri, hardware provision without electricity reliability, maintenance infrastructure, teacher competency, and appropriate content is not merely ineffective but actively misleading, as it allows policymakers to claim digital inclusion without delivering educational impact.

The study's finding that gender does not reach statistical significance as an independent predictor (controlling for structural access variables) is notably different from studies in other Indian states. It suggests that in Jalpaiguri's context, class and geographical exclusion are so pervasive that they subsume gender effects — implying that broad structural access improvements will benefit girls proportionally. However, this finding should not be interpreted as gender neutrality: qualitative data confirm that girls face additional social restrictions on device use and internet access at the household level, particularly in tea-garden communities.

8. Policy Suggestions and Recommendations

Based on the empirical evidence, the study proposes the following evidence-based, contextually grounded recommendations:

8.1 Last-Mile Connectivity Infrastructure

- The state government, in partnership with the Department of Telecommunications (DoT), should prioritise BharatNet Phase III implementation in digitally dark gram panchayats of

Matiali, Nagrakata, and Mal blocks, establishing fibre-to-school connectivity for all government and government-aided institutions.

- Solar-powered Wi-Fi hotspots at gram panchayat bhavans and primary health centres should be established, doubling as community digital access points beyond school hours.
- The state should advocate for targeted tower installation in areas exceeding 10 km distance to the nearest mobile tower, identified as critical educational impact zones by this study.

8.2 Community Digital Learning Centres

- Block-level Community Digital Learning Centres (CDLCs) should be established at existing BRC/CRC (Block/Cluster Resource Centre) buildings, equipped with broadband, 15–20 computers, printers, and solar backup power, supervised by trained Digital Facilitators.
- CDLCs should operate extended hours (morning and evening) to accommodate plantation workers' children and adolescent girls who face mobility constraints during regular school hours.

8.3 Teacher Capacity Development

- The District Institute of Education and Training (DIET) should design and implement a structured 60-hour ICT-Integrated Pedagogy Certificate Programme, replacing ad hoc one-day workshops, with modular delivery over one academic year.
- A cohort of Digital Mentor Teachers (2 per cluster) should be trained at advanced level and tasked with peer mentoring and troubleshooting within their cluster, creating a sustainable local knowledge ecosystem.
- Women teachers should be specifically identified for advanced ICT leadership training to address their documented double exclusion.

8.4 Contextualised Digital Content

- The District Education Department should commission the development of digitised learning materials in Rajbanshi, Mech, Santali, Nepali, and Oraon languages, aligned with state curriculum standards, for delivery through the DIKSHA platform and offline media (SD cards, pen drives).

- Community content co-creation — involving local teachers, tribal education committees, and youth volunteers — should be institutionalised as an annual content development exercise.

8.5 Device Access and Affordability

- A district-level student device lending programme should be established, beginning with secondary school students (Classes IX–XII) in the most deprived blocks, leveraging district education fund allocations and CSR contributions from tea companies operating in the district.
- The state government should examine the feasibility of subsidised shared family data plans for BPL households with school-enrolled children, building on the model of existing digital welfare schemes.

8.6 Monitoring and Accountability

- A real-time District Digital Education Dashboard should be developed, aggregating school-level ICT infrastructure data, teacher training completion rates, and student digital literacy assessments, updated quarterly and publicly accessible.
- Annual Digital Equity Audits, conducted by an independent panel including civil society and community representatives, should assess programme implementation and educational impact.

9. Conclusion

This study has produced the most comprehensive empirical account to date of the digital divide and its educational consequences in rural Jalpaiguri district, West Bengal. The evidence is unambiguous: the district faces a severe, multi-dimensional digital divide — in infrastructure, in affordability, in human capacity, and in content relevance — that causally contributes to persistently low academic performance, high dropout rates, and constrained pathways to higher education for its most marginalised children. The quantitative findings — with 42.3% of schools severely digitally deprived, internet penetration at barely 18.4%, and digital access parameters collectively explaining 61.7% of variance in academic outcomes — demand urgent policy response. The qualitative evidence enriches these statistics with the lived texture of exclusion: the locked computer room, the data recharge that parents cannot afford, the teacher too anxious to demonstrate technology, the tribal child whose language is absent from every platform. Yet the study also documents that the digital divide is not immutable. Blocks and schools that have benefited from targeted infrastructure investment, however modest, show meaningfully better educational outcomes. This evidence of tractability should inspire policy confidence: the gap can be closed, provided interventions address all dimensions of the divide simultaneously — connectivity, hardware, electricity, teacher capacity, content, and affordability — rather than pursuing single-axis solutions. The recommendations offered here are specific, costed in their design considerations, and grounded in the district's particular social and geographical ecology. Their implementation will require sustained political will, inter-departmental coordination, and meaningful community participation. The children of rural Jalpaiguri — many of whom have never touched a working computer, never accessed the internet, never encountered a digital textbook — cannot wait for the digital revolution to reach them by default. Equitable digital access must be understood, and acted upon, as a fundamental educational right.

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