Digital Access and Educational Inequality among School Students in India: Regional, Gender and School-Level Disparities

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Abstract

Digital technology has become increasingly important to school education in India, but expansion in connectivity has not produced equal opportunities for students. This study examines digital access and educational inequality among school students using secondary data from UDISE+ 2025–26, the NITI Aayog analysis of UDISE+ data for 2014–15 to 2024–25, and the Annual Status of Education Report (ASER) 2024. The analysis distinguishes between school-level digital infrastructure, household access, individual control over devices, digital skills and educational use. At the national level, the proportion of schools with computer facilities reached 69.9 per cent and internet connectivity 67.4 per cent in 2025–26. The longer comparable UDISE+ series shows that functional computer availability rose from 26.42 per cent in 2014–15 to 64.7 per cent in 2024–25, while school internet access rose from 8.05 to 63.5 per cent. These improvements conceal striking interstate disparities: in 2024–25 computer availability ranged from 100 per cent in Lakshadweep to 19.7 per cent in Meghalaya, while internet availability ranged from 100 per cent in several Union Territories to 18.6 per cent in West Bengal. ASER 2024 further reveals that household smartphone availability among rural adolescents aged 14–16 is close to universal, but access does not imply autonomy or digital competence. Although 90.2 per cent of boys and 88.1 per cent of girls reported a smartphone at home, only 36.2 per cent of boys and 26.9 per cent of girls who could use a smartphone owned one themselves. Gender differences become more pronounced in effective device availability, digital safety and selected digital tasks. The study concludes that India's contemporary digital divide is increasingly a divide not simply of connectivity but of ownership, autonomy, skills, quality of access and meaningful educational use.

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Introduction

Digital technology now occupies an important position in India's school-education system. Online learning platforms, digital textbooks, smart classrooms, learning-management systems, educational videos and mobile applications increasingly supplement conventional classroom teaching. The experience of school closures during the COVID-19 pandemic also demonstrated that access to digital technology can become critical for continuity of education. Research conducted during that period showed, however, that access to a device or internet connection did not necessarily translate into regular or effective participation in remote learning. Differences emerged by gender, household circumstances, geographical location and type of school.

India has subsequently expanded digital infrastructure within its school system. According to UDISE+ 2025–26, the country has approximately 14.67 lakh schools, 24.72 crore students and 1.03 crore teachers. Computer facilities are now available in 69.9 per cent of schools and internet connectivity in 67.4 per cent. These national averages demonstrate substantial progress, but they also imply that digital infrastructure is not yet universal.

More importantly, digital inequality is multidimensional. A student may live in a household containing a smartphone without having unrestricted access to it. A school may report internet connectivity while possessing an insufficient number of functioning devices. Students may be able to operate a phone for entertainment but lack the skills required to search for reliable information, use educational platforms or protect themselves online.

The contemporary digital divide should therefore be understood through at least four dimensions: availability, autonomy, capability and meaningful use. This study examines these dimensions and investigates how they intersect with regional and gender inequalities among Indian school students.

Objectives of the Study

The study has four objectives:

1. To examine the growth of digital infrastructure in Indian schools during the last decade.
2. To analyse interstate disparities in school computer and internet availability.
3. To examine gender differences in smartphone access, ownership, use and digital skills among school-age adolescents.
4. To assess how unequal digital access can reinforce broader educational inequality and identify appropriate policy responses.

Research Questions

The study addresses four research questions:

1. How has digital access in Indian schools changed during the last decade?
2. How large are the differences in computer and internet availability across Indian States and Union Territories?

3. Do boys and girls experience comparable access, autonomy and competence in using digital devices?
4. What forms of digital inequality are most relevant for achieving equitable educational opportunities in India?

Review of Literature

The literature on the digital divide has progressively moved beyond a binary distinction between individuals who have and do not have access to technology. Contemporary research distinguishes physical access from effective access, frequency and purpose of use, digital capability and the benefits ultimately obtained from technology.

Evidence from India during COVID-19 clearly demonstrated this distinction. Van Cappelle et al. (2021), analysing evidence from six Indian states, concluded that household technology availability did not necessarily translate into effective participation in distance learning. They identified differences in technology utilisation and perceived learning according to gender, location and school type. The authors consequently argued that educational policy needs to address the effective use of available technology rather than focusing exclusively on device penetration.

Dhaygude, Lapsiya and Chakraborty (2022), through qualitative research involving students and other educational stakeholders, similarly found that students attending resource-constrained government schools faced multiple barriers, including limited device availability, unreliable internet connectivity, network quality and the cost of data. Their findings demonstrate that digital exclusion is generated through combinations of technological and socioeconomic constraints rather than through one factor alone.

Jafar, Ananthpur and Venkatachalam (2023) examined access to online education in Tamil Nadu. Their analysis showed important rural–urban differences in access to computers and internet connectivity during the pandemic. They also found that alternative delivery mechanisms such as educational television could partly reduce disadvantages where continuous online access was unavailable. This suggests that digital inclusion need not depend exclusively on high-bandwidth internet-based learning.

The relationship between digital inequality and social inequality becomes particularly significant among historically disadvantaged communities. Nayak and Alam (2022), studying tribal communities in rural Jharkhand, found that limited infrastructure and affordability interacted with sociocultural and gender factors. Tribal girls experienced barriers that could not be explained merely by whether a digital device existed within the household. Family attitudes, control over technology and perceptions regarding girls' education also affected actual educational access.

These studies indicate that three levels of the digital divide require distinction. The first-level divide concerns physical access to devices and connectivity. The second-level divide concerns differences in skills and effective use. A further outcome-related divide emerges when apparently similar access produces different educational benefits. The present study applies this broader framework to contemporary UDISE+ and ASER evidence.

Data and Methodology

The study employs a descriptive and comparative secondary-data methodology. The latest national school-infrastructure position is examined using UDISE+ 2025–26, released by the Ministry of Education in July 2026. For temporal and interstate analysis, the study uses NITI Aayog's *School Education System in India: Temporal Analysis and Policy Roadmap for Quality Enhancement* published in May 2026. The report provides harmonised UDISE/UDISE+ indicators from 2014–15 to 2024–25 and therefore allows consistent comparison of digital infrastructure across states.

Student-level analysis is based on ASER 2024, which surveyed more than 650,000 children in over 600 rural districts across 26 states and two Union Territories. For the first time in its nationwide survey, ASER collected representative information on smartphone access, use and digital skills among children aged 14–16.

Percentage-point change is calculated as:

$$PP\ Change = Percentage_{later} - Percentage_{earlier}$$

Regional disparity is expressed through the range:

$$Regional\ Gap = Highest\ State\ Value - Lowest\ State\ Value$$

Here, PP Change shows the change between the later and earlier percentage values, while Regional Gap measures the difference between the highest and lowest state values.

Gender differences are calculated as the percentage for boys minus the corresponding percentage for girls. The analysis is descriptive and therefore does not interpret observed relationships as causal effects.

Results and Analysis

Rapid Expansion of Digital Infrastructure

India has experienced a substantial transformation in the availability of computers within schools. In 2014–15, only 26.42 per cent of schools had functional computers. By 2024–25, this had increased to 64.7 per cent, representing an increase of 38.28 percentage points. Internet connectivity expanded even more rapidly. Only 8.05 per cent of schools reported an internet facility in 2014–15, compared with 63.5 per cent in 2024–25. The increase amounts to 55.45 percentage points.

Table 1. Expansion of Digital Infrastructure in Indian Schools

Indicator	2014–15	2024–25	Percentage-point change
Schools with functional computers	26.42%	64.7%	+38.28
Schools with internet facility	8.05%	63.5%	+55.45
Schools with functional smart classrooms*	14.9%	30.6%	+15.7

Smart-classroom comparison is from 2021–22 to 2024–25 because comparable data are available only for this shorter period.

Source: NITI Aayog (2026), based on UDISE+.

The latest 2025–26 data indicate further progress: 69.9 per cent of schools now report computer facilities and 67.4 per cent internet connectivity. These figures are important for two reasons. First, school connectivity is no longer a marginal phenomenon; it has entered the mainstream infrastructure of Indian education. Second, national access remains incomplete. Even after rapid recent expansion, approximately three out of every ten schools do not report a computer facility, and around one-third lack internet connectivity.

Interstate Inequality in Computer Availability

National averages conceal very large differences across states. In 2024–25, computer facilities were reported by 100 per cent of schools in Lakshadweep, 99.9 per cent in Delhi, 99.5 per cent in Kerala, Puducherry and Chandigarh, and 99 per cent in Punjab. At the lower end, only 19.7 per cent of schools in Meghalaya had computer facilities. The corresponding proportions were 25.1 per cent in West Bengal, 25.2 per cent in Bihar, 38.0 per cent in Manipur and 43.1 per cent in Jammu and Kashmir.

The difference between Lakshadweep and Meghalaya was therefore:

$$100 - 19.7 = 80.3 \text{ percentage points}$$

Such a gap indicates that the national digital transformation of schooling is occurring at markedly different speeds.

Table 2. Selected Interstate Differences in School Computer Facilities, 2024–25

Relatively high availability	% schools	Relatively low availability	% schools
Lakshadweep	100.0	Meghalaya	19.7
Delhi	99.9	West Bengal	25.1
Kerala	99.5	Bihar	25.2
Puducherry	99.5	Manipur	38.0
Punjab	99.0	Jammu & Kashmir	43.1

Source: NITI Aayog (2026), UDISE+ 2024–25.

The decade-long changes are equally revealing. Assam increased computer availability from 9.8 per cent to 78.7 per cent, Jharkhand from 9.7 to 76 per cent and Odisha from 13.7 to 76.7 per cent. Conversely, progress was substantially slower in Meghalaya, West Bengal and Manipur. This demonstrates that historical disadvantage does not inevitably produce persistent digital disadvantage. Rapid improvement is possible where infrastructure expansion is sustained.

A Stronger Regional Divide in Internet Connectivity

Internet access displays a similarly unequal geographical distribution. The national average in 2024–25 was 63.5 per cent. Delhi, Chandigarh and Lakshadweep reported universal coverage, while Puducherry reached 99.6 per cent, Dadra and Nagar Haveli and Daman and Diu 99.5 per cent, Andhra Pradesh 99 per cent, Gujarat 96.5 per cent and Kerala 91.7 per cent.

At the other end, internet facilities were reported in only:

- 18.6 per cent of schools in West Bengal;
- 26.4 per cent in Meghalaya;
- 33.6 per cent in Arunachal Pradesh;
- 36.6 per cent in Manipur;
- 41.7 per cent in Tripura;
- 45.7 per cent in Madhya Pradesh; and
- 45.9 per cent in Uttar Pradesh.

The range between 100 per cent and 18.6 per cent is 81.4 percentage points.

Table 3. Selected Interstate Differences in Internet Facilities, 2024–25

State/UT	Internet facility (%)
Delhi	100.0
Chandigarh	100.0
Lakshadweep	100.0
Andhra Pradesh	99.0
Gujarat	96.5
Kerala	91.7
Uttar Pradesh	45.9
Madhya Pradesh	45.7
Tripura	41.7
Manipur	36.6
Arunachal Pradesh	33.6
Meghalaya	26.4
West Bengal	18.6

National average: 63.5 per cent.

Source: UDISE+ 2024–25, compiled by NITI Aayog (2026).

An important finding is that digital inequality does not correspond perfectly with conventional perceptions of economic or technological development. Karnataka, despite being home to Bengaluru and India's major information-technology sector, reported internet facilities in only 50.7 per cent of schools in 2024–25.

Conversely, Bihar's internet connectivity increased from only 1.3 per cent in 2014–15 to 84.8 per cent in 2024–25. Assam increased from 1.3 to 87.2 per cent and Odisha from 1.8 to 83.8 per cent. These changes demonstrate the capacity of targeted infrastructure expansion to alter the geography of school connectivity rapidly.

Household Smartphone Access Is Not the Same as Student Access

The school-level evidence represents only one dimension of inequality. ASER 2024 provides a substantially different picture at the household and individual level among rural adolescents aged 14–16. At first sight, the digital divide appears to have narrowed dramatically. 89.1 per cent of surveyed adolescents reported that a smartphone was available at home.

However, household availability did not guarantee that the child could actually use the device whenever needed.

Table 4. Smartphone Access and Autonomy among Rural Adolescents, 2024

Indicator	Boys (%)	Girls (%)	All (%)	Gender gap
Smartphone available at home	90.2	88.1	89.1	2.1
Could bring smartphone for digital assessment	70.2	62.2	65.9	8.0
Can use a smartphone	85.5	79.4	82.2	6.1
Own smartphone among those who can use one	36.2	26.9	31.4	9.3

Source: ASER 2024; figures reproduced in NITI Aayog (2026).

The pattern is analytically important. The gender difference in having a smartphone somewhere in the household is relatively modest at 2.1 percentage points. The difference increases to 8 percentage points when students are required to make a phone available for a task and to 9.3 percentage points in personal ownership. Therefore, conventional household-access measures can substantially underestimate digital inequality. A household may technically possess a smartphone while a child must share it with parents or siblings, can access it only during certain hours, or lacks authority to use mobile data for educational purposes. The distinction is especially important for girls.

The Gender Digital Divide Extends Beyond Ownership

ASER 2024 demonstrates that differences continue after basic access is achieved. Among children capable of using smartphones, educational use during the reference week was remarkably similar: 57.2 per cent of boys and 56.8 per cent of girls reported education-related smartphone activity. This indicates that, once meaningful access is available, girls demonstrate demand for educational use comparable with boys. However, significant differences appear in autonomy and digital safety.

Table 5. Gender Differences in Smartphone Use and Digital Safety

Digital behaviour/skill	Boys (%)	Girls (%)	Gap (percentage points)
Used smartphone for education	57.2	56.8	0.4
Used social media	78.8	73.4	5.4
Can block/report a profile	65.2	58.7	6.5
Can make profile private	60.3	50.2	10.1
Can change password	65.4	50.1	15.3

Source: ASER 2024; NITI Aayog (2026).

The data reveal a crucial distinction between digital access and digital agency. The largest gender gap in this set of indicators concerns the ability to change a password, at 15.3 percentage points. The ability to make a profile private differs by more than 10 percentage points. These are not merely technical skills. They influence students' ability to use digital environments independently and safely.

ASER also directly tested selected skills. Among children able to participate in the smartphone assessment, 81.5 per cent of boys compared with 72.4 per cent of girls could successfully set an alarm. Gender differences were evident across several tasks, although in states including Karnataka, Andhra Pradesh and Kerala girls performed at similar or higher levels on some digital tasks. The geographical variation suggests that the gender digital divide is not technologically inevitable; social and educational contexts can narrow it.

Availability, Ownership and Meaningful Educational Use

The results suggest a useful hierarchy of digital access:

> Household availability → effective availability → operational capability → personal autonomy → educational use → beneficial learning outcomes

A student can be counted as digitally connected at the first stage while remaining disadvantaged at later stages. ASER shows that 89.1 per cent of rural adolescents have a smartphone at home and 82.2 per cent report knowing how to use one. Yet only 57 per cent of smartphone users reported education-related activity during the previous week, compared with 76 per cent who used social media.

This difference should not be interpreted as evidence that social-media use itself harms education. Instead, it shows that the presence and use of a smartphone do not automatically generate sustained educational engagement. Educational technology therefore requires more than connectivity. Students need appropriate learning material, digital guidance, teachers who integrate technology pedagogically and an environment in which devices are available at the time learning is required.

The Digital Divide as an Educational Inequality Multiplier

The findings suggest that digital inequality frequently overlaps with pre-existing forms of disadvantage. A student attending a poorly connected school may also belong to a household where devices are shared. A rural girl may technically live in a smartphone-owning household

but exercise less control over the device. A student in a remote or tribal area can experience weak connectivity together with linguistic, geographical and socioeconomic disadvantages.

Research in rural Jharkhand demonstrates precisely this interaction: technological barriers affecting tribal girls were reinforced by household and sociocultural constraints.

This can be conceptualised as a cumulative digital disadvantage:

Educational Digital Inequality =
Infrastructure Gap + Device Gap + Access Gap +
Skill Gap + Autonomy Gap + Use Gap

The expression is conceptual rather than a statistical equation. Its purpose is to emphasise that no single infrastructure indicator captures the complete digital divide.

Major Findings

The analysis produces six important findings.

First, India's school digital infrastructure has expanded rapidly. Functional computer availability increased by more than 38 percentage points between 2014–15 and 2024–25, while internet connectivity increased by approximately 55 percentage points.

Second, the expansion has been geographically unequal. The interstate range exceeds 80 percentage points for both computer and internet availability. Third, household smartphone access among rural adolescents is now very high. Therefore, the nature of digital exclusion is gradually moving beyond simple household ownership.

Fourth, access and autonomy are substantially different. Nearly nine out of ten adolescents have a smartphone at home, but individual ownership is far lower. Fifth, gender differences are comparatively small in nominal household smartphone availability but widen in device availability, personal ownership, digital-safety capabilities and some practical digital skills. Sixth, having digital technology does not guarantee its educational use. Only about 57 per cent of adolescents capable of smartphone use reported using it for an educational activity during the reference week.

Discussion

The findings indicate that India's digital divide is undergoing a structural transformation. During the early expansion of digital education, the principal question was whether students had access to a computer or the internet. That question remains relevant in poorly connected schools and regions, but it no longer adequately captures inequality across the education system.

The more important contemporary question is increasingly what kind of access a student has and what the student can accomplish with it. This distinction explains the coexistence of high smartphone penetration with continued inequality. A shared household device cannot necessarily support simultaneous educational requirements of several children. Similarly, a mobile handset may be technically capable of accessing learning content while its small screen, limited data, weak connectivity or restricted availability reduces its educational usefulness.

The gender evidence is particularly informative. The household smartphone gap is only 2.1 percentage points, which might suggest near equality. Yet ownership differs by 9.3 percentage points among smartphone users, and digital-safety skills show even wider differences. Consequently, relying exclusively on household ownership would produce an overly optimistic interpretation of digital equality.

Regional disparities also require differentiated explanations. States with low school internet access require infrastructure investment. States with widespread connectivity but poor educational utilisation require teacher training and pedagogical integration. Areas with high household smartphone access but unequal individual autonomy require different interventions again. A uniform digital-education strategy is therefore unlikely to address the complete range of inequalities.

Policy Recommendations

The first priority should be to establish a minimum digital infrastructure entitlement for every school. Electricity, reliable broadband connectivity and functioning student-accessible devices should be treated as an integrated package rather than independent facilities. Second, policy monitoring should move beyond the binary question of whether a school “has a computer”. Indicators should capture the number of functioning devices relative to enrolment, bandwidth and reliability, student access time, frequency of use and the extent to which digital technology is incorporated into teaching.

Third, shared-device inequality at household level requires greater recognition. Schools can provide device libraries, supervised digital-learning laboratories and extended ICT access before or after regular instructional hours, particularly for students without personal devices. Fourth, digital inclusion programmes should explicitly address the gender gap in digital autonomy. Training should include device operation, information retrieval, privacy settings, password security, online harassment reporting and critical evaluation of online information.

Fifth, educational platforms should follow a low-bandwidth and mobile-first design. The widespread availability of smartphones makes mobile-compatible learning essential, while downloadable and offline content can support students experiencing intermittent connectivity. Sixth, digital strategies need geographical targeting. States and districts significantly below national levels should receive additional infrastructure and technical support instead of uniform per-school allocations.

Finally, access should not be treated as the policy objective in itself. The relevant educational question is whether technology contributes to learning. Future monitoring should link digital infrastructure with frequency of classroom use, digital skills and learning outcomes while avoiding assumptions that correlation demonstrates causation.

Limitations

This study relies on secondary data and therefore shares the limitations of the underlying datasets. UDISE+ measures school-reported infrastructure. The presence of a computer or internet facility does not indicate the number of devices, connection speed, frequency of use or pedagogical effectiveness.

ASER 2024 digital-literacy data apply to rural children aged 14–16 and should not be interpreted as nationally representative estimates for all ages or urban adolescents. School-level and household-level datasets also refer to different units of analysis and cannot be directly merged to estimate causal relationships.

Furthermore, the analysis demonstrates association and inequality but does not establish that lack of digital access independently causes differences in learning outcomes. Household income, parental education, school quality, geography and numerous other factors can affect both digital access and educational achievement.

Conclusion

India has achieved remarkable progress in the digitalisation of school education. Computer availability and internet connectivity have expanded rapidly, and smartphone access among rural adolescents is approaching universality. These developments have substantially increased the potential reach of digital learning. Yet the evidence shows that connectivity does not equal equality.

A school in one state may have near-universal access to computers and internet facilities while most schools in another state remain without them. A boy and a girl may both live in homes containing smartphones while differing substantially in their ability to bring, own, control and safely operate those devices. The emerging digital divide in Indian education is therefore increasingly a divide of quality of access, autonomy, competence and meaningful use, rather than merely one of device presence.

This shift has important implications for educational policy. Closing the remaining infrastructure gap remains necessary, but it is no longer sufficient. India's next phase of digital education must ensure that students can access, control, understand, safely use and educationally benefit from technology irrespective of gender, socioeconomic background or geographical location. Digital inclusion should consequently be treated not simply as an infrastructure programme but as an integral component of educational equity.

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