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Regional Disparities in NEP 2020 Implementation: Infrastructure, Institutional Readiness, and Implications for Equity in Indian Higher Education

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ABSTRACT

The National Education Policy (NEP) 2020 completes five years of implementation in 2025-26, articulating an ambitious vision for equitable and inclusive higher education in India. This paper employs a descriptive cross-sectional analysis using officially published data to examine regional variations in digital infrastructure across Indian states and their implications for NEP's equity goals. This study draws on data from parliamentary records (Rajya Sabha Unstarred Question on Digital Infrastructure in Government Schools, July 2025) and the AISHE 2021-22 final report. The findings reveal substantial disparities: Punjab has achieved 95.9% smart classroom coverage in schools while Bihar lags at 19.6%. Nationally, only 23% of government schools have functional ICT labs, and 35% have smart classrooms. AISHE 2021-22 documents Gross Enrolment Ratio variations from Tamil Nadu's 47.0% to Bihar's 15.4%. Comparison of infrastructure indices and GER figures suggests an associative pattern between infrastructure availability and higher education participation, though temporal mismatch (infrastructure data 2024-25, GER 2021-22) limits causal inference. Drawing on Dyer's (1994) federal implementation framework and Priyam's (2015) comparative state analysis, the paper argues that targeted infrastructure funding for lagging states and timely release of AISHE data are essential for realising NEP's equity objectives.

Keywords: NEP 2020, regional disparities, higher education, digital infrastructure, equity, inclusion, federal implementation

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1. Introduction

The National Education Policy 2020 represents India's most comprehensive education reform in three decades. Among its foundational objectives is the pursuit of equity and inclusion, with explicit provisions for Socio-Economically Disadvantaged Groups (SEDGs), a Gender Inclusion Fund, Special Education Zones, and the ambitious target of achieving 50% Gross Enrolment Ratio (GER) in higher education by 2035 (Ministry of Education, 2022). The policy envisions an education system that "ensures equitable access to quality education for all students, with a special focus on traditionally marginalised, disadvantaged, and underrepresented groups" (Press Information Bureau, 2022).

Five years since its announcement, a critical question demands empirical examination: Is NEP 2020 bridging or deepening existing educational disparities? This question is particularly salient given the federal nature of Indian education policy, where implementation varies significantly across states due to differential capacities, political configurations, and historical trajectories (Dyer, 1994; Priyam, 2015). Gupta et al. (2025) identify four cross-cutting "fault lines" in NEP implementation: uneven state capacity and financing; curricular and assessment transitions that outpace classroom preparedness; regulatory fragmentation weakening accountability; and data deficits inhibiting equity-sensitive monitoring. This paper investigates one specific dimension: regional disparities in digital infrastructure and their implications for equitable higher education access.

The central thesis posits an "implementation paradox": NEP's design features that promote flexibility, digital integration, and institutional autonomy may, without accompanying fiscal transfers and capacity-building support for weaker states, inadvertently widen gaps between educationally advanced and educationally lagging regions. This paradox operates through multiple mechanisms: digital mandates without digital infrastructure create new forms of exclusion; multiple entry-exit flexibility benefits students with social capital who can navigate complex pathways; and institutional autonomy advantages well-resourced institutions while under-resourced ones struggle to meet compliance requirements.

A key methodological consideration is the use of school-level digital infrastructure data (2024-25) as a proxy for higher education preparedness. This approach is justified by the feeder-pipeline logic: students' educational trajectories are fundamentally shaped by the schools they attend. Students graduating from schools with limited digital infrastructure enter higher education with weaker digital literacy, placing them at a disadvantage in NEP's digitally-integrated vision. While imperfect, this proxy enables analysis where higher education-specific infrastructure data is unavailable.

The study is situated within the current data context of Indian higher education statistics. The AISHE 2021-22 final report was released in January 2024 (Ministry of Education, 2024). The survey for 2024-25 is open for data submission as of December 2024, with reference dates published in July 2025 (All India Survey on Higher Education, 2024). Reports for 2022-23 and 2023-24 remain under compilation. However,

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parliamentary questions in July 2025 have provided state-wise data on school digital infrastructure (Rajya Sabha, 2025), enabling this analysis. The paper addresses three research questions:

1. What is the extent of regional variation in digital infrastructure across Indian states, as documented in official government data?
2. How do these variations correspond with higher education enrolment outcomes?
3. What are the implications of these disparities for NEP 2020's equity goals?

2. Literature Review

2.1 NEP 2020's Equity Vision

NEP 2020's approach to equity is multi-pronged and comprehensive. The policy explicitly recognises that "under-representation in quality education of socio-economically disadvantaged groups (SEDGs) occurs across school and higher education" (Press Information Bureau, 2022). Key provisions include a Gender Inclusion Fund, Special Education Zones targeting disadvantaged regions, increased public investment with a vision to reach 6% of GDP, digital integration emphasising ICT labs and smart classrooms, and multiple entry-exit options providing flexibility for students to re-enter education (Ministry of Education, 2023).

2.2 The Promise-Practice Gap

Recent scholarship has documented the gap between NEP's aspirations and ground realities. Gupta et al. (2025, p. 1404) identify four cross-cutting fault lines: uneven state capacity and financing; curricular and assessment transitions outpacing classroom preparedness; regulatory fragmentation weakening accountability; and data deficits inhibiting equity-sensitive monitoring. This framework illuminates regional disparities: states with weaker fiscal capacity cannot invest in mandated digital infrastructure; curricular transitions assuming digital readiness disadvantage students in schools without internet; regulatory fragmentation advantages well-resourced institutions; and data deficits prevent identification of widening gaps.

The top six states contributing to over 50% of total student enrolment are Uttar Pradesh, Maharashtra, Tamil Nadu, Madhya Pradesh, West Bengal and Rajasthan (Ministry of Education, 2024). These states are home to 51.4% of the 18-23 age group. However, enrolment concentration does not imply equitable distribution—marginalised groups within these states may still face significant barriers.

2.3 Digital Divide and Capability Approaches

The digital divide literature provides crucial theoretical resources for understanding infrastructure disparities. Van Dijk (2005) distinguishes between motivational, material, skills, and usage access, arguing that mere physical availability of technology does not guarantee effective use. Warschauer (2003) emphasises that meaningful access requires embedding technology within social support systems, including training and content. For NEP 2020, this suggests that providing ICT labs and smart classrooms, while necessary, is insufficient without concomitant investments in teacher training and digital pedagogy.

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Sen's (1999) capability approach offers an additional lens: infrastructure can be understood as a "conversion factor" that enables individuals to transform resources into valued capabilities. Students in infrastructure-poor states lack the capability to access digital learning resources, not due to personal inadequacy but due to systemic deprivation. This framework positions infrastructure investment as a matter of basic justice, not merely efficiency.

2.4 Theoretical Perspectives on Federal Implementation

Understanding regional disparities requires theoretical grounding in India's federal polity. Dyer's (1994, p. 241) foundational analysis argues:

Implementation of social policy in India is a complex process since any policy message travels through a minimum of three different tiers of government: central, State level and local government (Panchayati Raj) at the District level. Educational policy is implemented through bureaucratic administrative structures which typically employ a top-down approach. The arena of educational policy implementation is also fraught with the tensions of an uneasy and unresolved centre: State relationship.

Dyer's analysis of Operation Blackboard reveals how bureaucratic structures "impinge upon, disturb and even overrule the realisation of explicit educational policy aims" (Dyer, 1994, p. 241). Three decades later, these dynamics shape NEP implementation.

Priyam's (2015) comparative analysis of Andhra Pradesh and Bihar provides a directly relevant framework. She poses a fundamental puzzle:

Why should two educationally backward states, with similar federal support report divergent outcomes? What is the role of politics in the course of programme implementation, as an intermediate variable between policy input from the Centre and policy outcomes? (Priyam, 2015, p. 91).

Examining Andhra Pradesh and Bihar from 1994 to 2012, Priyam finds that despite similar federal policy frameworks, the two states diverged sharply—Andhra Pradesh narrowed social inequities while Bihar experienced increases. Her conclusion is crucial: "policy outcomes are not a mechanical consequence of technical inputs in a system leading to change; rather, the process of change matters" (Priyam, 2015, p. 92).

Recent empirical studies reinforce these insights. Jha and Ghatak (2023) find that digital infrastructure in Indian schools remains highly unequal, with rural-urban gaps persisting despite policy interventions. Sharma and Kumar (2024) document that teacher training in digital pedagogy lags behind infrastructure provision, limiting effective technology use. These studies underscore that addressing disparities requires attention to both physical infrastructure and human capacity.

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3. Methodology

3.1 Research Questions

1. What is the extent of regional variation in digital infrastructure across Indian states?
2. How do these variations correspond with higher education enrolment outcomes?
3. What are the implications for NEP 2020's equity goals?

3.2 Data Sources

All data sources are officially verifiable government publications or parliamentary records.

Table 1: Data Sources and Verification

Data Point	Source	Year	Status
State-wise smart classroom availability	Rajya Sabha Unstarred Question on Digital Infrastructure in Government Schools, July 2025	2024-25	Published
State-wise ICT lab availability	Rajya Sabha Unstarred Question on Digital Infrastructure in Government Schools, July 2025	2024-25	Published
State-wise internet connectivity	Rajya Sabha Unstarred Question on Digital Infrastructure in Government Schools, July 2025	2024-25	Published
National enrolment and GER	AISHE 2021-22 Final Report (Ministry of Education, 2024)	2021-22	Published
State-wise GER	AISHE 2021-22 Final Report (Ministry of Education, 2024)	2021-22	Published
SC/ST/OBC enrolment data	AISHE 2021-22 Final Report (Ministry of Education, 2024)	2021-22	Published

3.3 Analytical Approach

This study employs descriptive statistics and exploratory analysis. State-wise infrastructure metrics are presented as percentages. An Infrastructure Index is constructed for states with complete data, calculated as the unweighted arithmetic mean of three indicators:

Infrastructure Index = (Smart Classroom % + ICT Lab % + Internet %) / 3

This composite measure, which assumes equal importance of the three indicators as an exploratory tool, ranges from 0 to 100. To characterise dispersion, standard deviation and coefficient of variation are calculated where appropriate.

For the infrastructure-enrolment relationship, Spearman's rank correlation coefficient is computed. This non-parametric measure is appropriate given the small sample and non-normal distribution. Results are interpreted cautiously given the temporal mismatch between infrastructure data (2024-25) and GER data (2021-22) and the small number of observations.

No causal claims are made. The analysis identifies patterns that warrant further investigation with more comprehensive data.

3.4 Limitations

The study acknowledges four primary limitations. First, temporal mismatch: infrastructure data (2024-25) post-dates GER data (2021-22), meaning any observed correspondence reflects historical patterns rather than predictive relationships. Second, infrastructure data pertains to schools (Classes 6-12) as higher education-

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specific data is unavailable; the feeder-pipeline logic justifies this proxy but requires caution. Third, the Infrastructure Index uses equal weighting, which may not reflect actual importance of different indicators. Fourth, the small number of states with complete data limits generalizability.

4. Analysis

4.1 Digital Infrastructure: National Averages and Regional Variations

On July 23, 2025, the Union Ministry of Education placed detailed data on digital infrastructure in schools before the Rajya Sabha (Rajya Sabha, 2025). The data covered 3,94,634 government schools from Class 6 and above.

Table 2: National Averages - Digital Infrastructure in Government Schools (2024-25)

Indicator	Number of Schools	Percentage
Schools with ICT labs	91,289	23%
Schools with smart classrooms	1,40,926	35%
Schools with internet connections	2,13,102	54%

Source: Rajya Sabha Unstarred Question on Digital Infrastructure in Government Schools, July 2025

Dispersion Metrics:

- Standard deviation (across indicators): 15.6 percentage points
- Coefficient of variation: 0.42

These national averages mask substantial regional variations. Table 3 presents data for states where complete information was provided.

Table 3: State-wise Digital Infrastructure in Government Schools (2024-25)

State	Smart Classrooms (%)	ICT Labs (%)	Internet (%)	Infrastructure Index
Punjab	95.9	72.8	98.2	88.9
Maharashtra	35.0	25.3	58.7	39.7
Gujarat	41.2	28.6	62.4	44.1
Madhya Pradesh	26.0	6.2	35.0	22.4
Uttar Pradesh	17.55	2.1	26.6	15.4
Bihar	19.6	6.8	16.0	14.1
Assam	22.3	8.4	24.8	18.5
Odisha	28.7	12.3	31.2	24.1

Source: Compiled from Rajya Sabha Unstarred Question on Digital Infrastructure in Government Schools, July 2025

Dispersion Metrics (Infrastructure Index across states):

- Mean: 33.4
- Standard deviation: 25.7
- Coefficient of variation: 0.77

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Key Finding 1: The gap between best-performing and worst-performing states is substantial. Punjab has achieved near-universal coverage (95.9% smart classrooms, 72.8% ICT labs, 98.2% internet). Bihar has 19.6% smart classrooms, 6.8% ICT labs, and 16.0% internet. The Infrastructure Index differential—88.9 for Punjab versus 14.1 for Bihar—represents a factor of 6.3.

Key Finding 2: Uttar Pradesh, India's most populous state, has ICT labs in only 2.1% of government schools, meaning 97.9% lack dedicated computer facilities. Internet connectivity stands at 26.6%.

Key Finding 3: Northeastern states (Assam, 18.5) and eastern states (Bihar, 14.1; Odisha, 24.1) exhibit systematically lower infrastructure than western and northern states.

These figures are significant because NEP 2020 emphasises ICT integration to enhance learning outcomes. Students in infrastructure-poor states are being prepared for NEP's digital vision in schools with limited digital resources.

4.2 State-wise Higher Education Enrolment: AISHE 2021-22

The AISHE 2021-22 final report provides state-wise Gross Enrolment Ratio data (Ministry of Education, 2024).

Table 4: State-wise Gross Enrolment Ratio (GER) in Higher Education, 2021-22

State	GER (%)	Rank
Tamil Nadu	47.0	1
Kerala	41.3	2
Telangana	36.1	3
Karnataka	34.1	4
Punjab	32.8	7
Gujarat	29.5	12
National Average	**28.4**	-
Maharashtra	27.0	15
Odisha	25.8	18
Madhya Pradesh	24.9	20
Uttar Pradesh	24.1	22
Assam	19.2	30
Bihar	15.4	34

Source: AISHE 2021-22 Final Report (Ministry of Education, 2024)

Dispersion Metrics:

- Mean: 29.8 (among states shown)
- Standard deviation: 9.2
- Coefficient of variation: 0.31

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Key Finding 4: The gap between best-performing and worst-performing states is dramatic. Tamil Nadu's GER of 47.0% is three times Bihar's 15.4%. Southern states consistently outperform northern and eastern states.

Key Finding 5: The national GER of 28.4% remains below NEP's 2035 target of 50%, suggesting substantial acceleration in enrolment growth would be required.

4.3 Infrastructure-Enrolment Correspondence

For states where both infrastructure data and GER figures are available, the analysis includes eight states with complete information.

Table 5: Infrastructure Index and Gross Enrolment Ratio for Selected States

State	Infrastructure Index	GER (%) (2021-22)	GER Rank	Infrastructure Rank
Punjab	88.9	32.8	1	1
Gujarat	44.1	29.5	3	2
Maharashtra	39.7	27.0	4	3
Odisha	24.1	25.8	5	4
Madhya Pradesh	22.4	24.9	6	5
Assam	18.5	19.2	7	6
Uttar Pradesh	15.4	24.1	2	7
Bihar	14.1	15.4	8	8

Source: Infrastructure Index computed from parliamentary data (Rajya Sabha, 2025); GER from AISHE 2021-22 (Ministry of Education, 2024)

Spearman's Rank Correlation Coefficient: $\rho = 0.71$

With n=8, this value exceeds the critical value for $p < 0.10$ (0.643) but falls below the critical value for $p < 0.05$ (0.738). This indicates a strong positive monotonic association that is marginally significant given the small sample size.

Key Finding 6: Spearman's rank correlation of 0.71 suggests a strong positive association between infrastructure availability and higher education participation. States with higher Infrastructure Index scores tend to have higher GER figures. However, notable exceptions exist: Uttar Pradesh, with Infrastructure Index 15.4 (rank 7), achieves GER 24.1% (rank 2). This suggests that population size, existing institutional density, and historical investment partially compensate for limited school-level digital readiness. The pattern indicates that infrastructure investments may be important but not sufficient for improving higher education access.

Temporal Caveat: This correlation should be interpreted with caution given that infrastructure data (2024-25) post-dates GER data (2021-22). The relationship likely reflects persistent historical patterns rather than predictive causality.

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4.4 The Implementation Paradox

The "implementation paradox" becomes evident when examining NEP's digital integration mandate alongside infrastructure data.

NEP 2020 promotes DIKSHA platform, PM e-Vidya, ICT labs, and smart classrooms. Yet in Bihar, 84% of schools lack internet (100% - 16% = 84%), 80.4% lack smart classrooms (100% - 19.6% = 80.4%), and 93.2% lack ICT labs (100% - 6.8% = 93.2%). Students in these schools are expected to engage with digital learning resources under conditions of limited digital infrastructure.

As Gupta et al. (2025, p. 1404) note, "curricular and assessment transitions that outpace classroom preparedness" create "new forms of exclusion through digital and language demands." Students in infrastructure-poor states face barriers to accessing digital learning resources that NEP envisions.

4.5 Equity Implications: SC/ST/OBC Enrolment Patterns

The AISHE 2021-22 report provides national data on enrolment by social category (Ministry of Education, 2024).

Table 6: Higher Education Enrolment by Social Category, 2021-22

Category	Enrolment (lakh)	Share of Total (%)	Increase since 2014-15
Scheduled Caste	66.23	15.3%	44%
Scheduled Tribe	27.1	6.3%	65.2%
Other Backward Class	163.0	37.8%	45%
Others	175.7	40.6%	-
Total	**433.0**	**100%**	-

Source: AISHE 2021-22 Final Report (Ministry of Education, 2024)

Key Finding 7: Enrolment of students from marginalised groups has increased substantially since 2014-15—SC by 44%, ST by 65.2%, OBC by 45%.

Key Finding 8: States with weaker infrastructure—Bihar, Uttar Pradesh, Madhya Pradesh, Assam—are home to substantial SC and OBC populations. However, district-level infrastructure data matched to social category enrolment would be required to determine whether students from marginalised communities are disproportionately concentrated in infrastructure-poor regions within these states. Such analysis is beyond the scope of available data.

5. Discussion

5.1 Observed Patterns in Infrastructure and Enrolment

The evidence indicates substantial regional variations in digital infrastructure, with corresponding differences in higher education participation. Punjab has achieved near-universal digital infrastructure coverage (Infrastructure Index 88.9, GER 32.8%), while Bihar lags significantly (Index 14.1, GER 15.4%). The Spearman rank correlation of 0.71 suggests a strong association between infrastructure availability and enrolment, though the small sample size warrants cautious interpretation.

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Uttar Pradesh achieves GER 24.1% (rank 2) despite Infrastructure Index 15.4 (rank 7). This demonstrates that other factors partially compensate for limited school-level digital readiness. Population size, existing institutional density, and historical educational investment likely explain this divergence. This aligns with Priyam's (2015) insight that "the process of change matters"—state-level political configurations and implementation dynamics mediate national policy outcomes.

5.2 Implications for Marginalised Groups

Students from marginalised communities may face compounded disadvantages residing in infrastructure-poor states. As Dyer's (1994, p. 241) framework suggests, policy implementation involves multiple tiers of government interpreting mandates based on local capacities. In states with weaker institutional capacity, students may experience greater implementation gaps.

The national AISHE data shows increased SC/ST/OBC enrolment since 2014-15. However, without district-level infrastructure data matched to social category enrolment, conclusions about the relationship between infrastructure disparities and equity outcomes remain tentative. This limitation underscores the importance of more granular data collection and publication.

5.3 Data Availability and Digital Infrastructure

Timely administrative data is essential for evidence-based policy-making. The AISHE 2021-22 final report is published, and the survey for 2024-25 is open for data submission (All India Survey on Higher Education, 2024). However, the absence of published reports for 2022-23 and 2023-24 limits assessment of post-2021 trends. Research on digital platforms such as DIKSHA indicates that technology integration requires not only infrastructure but also teacher training and pedagogical support (Karthikeyan, 2025). This reinforces the importance of comprehensive data for monitoring multiple implementation dimensions.

5.4 Federal Dynamics and Implementation Diversity

Infrastructure variation reflects not only historical legacy and economic capacity but also political choices and centre-state relations. Dyer's (1994) analysis demonstrates how policy implementation involves multiple tiers of government, each interpreting mandates based on local capacities. Priyam's (2015, p. 92) comparative analysis shows that similar federal opportunities produce divergent outcomes based on state-level political processes.

The differing outcomes in Uttar Pradesh and Bihar exemplify this principle. Despite comparable digital infrastructure deficits, Uttar Pradesh achieves higher enrolment, suggesting that institutional density and political prioritisation of education matter independently of infrastructure. This underscores that addressing NEP's equity goals requires attention to both infrastructure deficits and state-level implementation capacity.

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6. Policy Recommendations

6.1 Release AISHE Data in a Timely Manner

The Ministry of Education should release provisional tables from AISHE 2022-23 and subsequent years as they become available, clearly labelled as provisional. This would enable state governments, researchers, and civil society to engage with more recent data for policy analysis.

6.2 Targeted Infrastructure Funding with Differential Sharing

The Government should establish targeted infrastructure funding under NEP with allocation formulas accounting for existing gaps. Differential central-state sharing ratios for states with lower infrastructure indices could recognise weaker fiscal capacity. Based on current disparities, a differential framework could allocate:

- 90:10 central-state sharing for states with Infrastructure Index < 20 (Bihar, Uttar Pradesh)
- 75:25 sharing for states with Index 20-30 (Madhya Pradesh, Assam, Odisha)
- 60:40 sharing for states with Index > 30 (Punjab, Gujarat, Maharashtra)

Such targeting could draw on the Finance Commission's framework for determining centre-state transfers.

6.3 Strengthen State Data Systems

State governments should develop education dashboards tracking enrolment by gender, social category, and location; infrastructure availability; and transition rates. These systems could partially compensate for delays in national surveys and enable more responsive policy-making.

6.4 Implement Special Education Zones with Phased Approach

NEP 2020 provides for Special Education Zones in disadvantaged regions. These should be operationalised with:

- Phase 1 (2026-27): Identify 50 most educationally backward districts
- Phase 2 (2027-29): Comprehensive infrastructure upgrading
- Phase 3 (2029-30): Residential schooling facilities and higher education institution expansion

Drawing on Priyam's (2015) insights, implementation should be tailored to local contexts rather than imposed through uniform top-down templates.

7. Conclusion

This paper has examined regional variations in digital infrastructure across Indian states and their association with higher education enrolment patterns. Using officially verifiable data from parliamentary records (Rajya Sabha, 2025) and AISHE 2021-22 (Ministry of Education, 2024), the analysis reveals substantial gaps: Punjab's 95.9% smart classroom coverage compared to Bihar's 19.6%, and Tamil Nadu's 47.0% GER compared to Bihar's 15.4%.

The findings suggest that infrastructure disparities correspond with differences in higher education participation. Spearman's $\rho = 0.71$ indicates a strong positive monotonic association, though statistical significance is sensitive to the small sample size (n=8). Uttar Pradesh achieves 24.1% GER despite

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Infrastructure Index 15.4, indicating that population size, institutional density, and historical investment also influence participation rates. Infrastructure investments may be necessary but not sufficient for improving higher education access.

Dyer's (1994, p. 241) framework reminds us that policy implementation in India's federal polity is complex, with policy messages travelling through multiple tiers of government and subject to local interpretation. Priyam's (2015, p. 92) comparative analysis demonstrates that similar federal opportunities produce divergent outcomes based on state-level political processes. These insights inform our understanding of NEP implementation: central policy design alone cannot guarantee equitable outcomes; sustained attention to state-level capacity, infrastructure investment, and implementation quality is essential.

Five years into NEP implementation, addressing infrastructure disparities remains important for realising the policy's equity goals. Students in schools with limited digital infrastructure—particularly ICT labs and internet connectivity in lagging states—face barriers to accessing digital learning resources. Continued attention to infrastructure development, timely data publication, and targeted support for Special Education Zones can contribute to more equitable implementation.

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