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Fostering success: A review of school climate and online resources in enhancing chemistry learning outcomes

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Abstract
This review investigates the dual impact of school climate and online educational resources on the learning outcomes of secondary school students in chemistry. With the increasing integration of technology in education and evolving pedagogical practices, the interplay between a supportive school environment and access to digital learning tools has become more crucial than ever. The paper explores how positive school climates characterized by safe peer interactions, strong teacher-student relationships, and administrative support enhance student engagement, motivation, and performance in chemistry. Additionally, the study evaluates the effectiveness of various online educational resources, such as simulations, videos, and learning management systems (LMS), in strengthening conceptual understanding and practical skills in the subject. Drawing on national and international studies, particularly from the Indian context, this review highlights the synergistic potential of blending technology with a conducive learning atmosphere. The paper concludes with evidence-based recommendations for educators and policymakers to bridge infrastructural gaps, strengthen teacher training, and ensure equitable access to technology for all learners.

Keywords: School climate, chemistry education, online educational resources, learning outcomes, digital learning, student engagement, India, educational technology, blended learning, secondary education

Introduction

1.1 Background of Chemistry Education

Chemistry, often called the "central science," is instrumental in connecting physical, biological, and applied sciences, while nurturing critical thinking, problem-solving, and scientific reasoning skills in students (Munroe, 1925 [39]**:** National Academies, 2012).However, chemistry remains one of the most challenging subjects for many secondary students, with high failure and attrition rates attributed to inaccessibility of quality resources, traditional pedagogy, and lack of motivation (Hussain, 2020**:** Brown *et al.*, 2023) [8].

1.2Purpose and Scope of the Review

This review aims to synthesize empirical evidence and literature regarding how school climate and online educational resources together influence learning outcomes in chemistry. We examine the existing research on school-related psychosocial environments and digital learning tools, their direct and interacting effects on student achievement in chemistry courses, and gaps where further research is needed. The analysis spans both traditional and pandemic-era contexts, highlighting adaptations across diverse educational settings.

1.3 Importance of School Climate and Online Resources

A supportive school climate, characterized by positive peer and teacher relationships, safety, and belonging, has been shown to enhance student mental health, engagement, and academic achievement across disciplines (Wang *et al.*, 2020**:** Goddard *et al.*, 2000). In science classrooms, positive climate fosters persistence faculty who create an environment perceived as *fostering* rather than merely transmitting knowledge support higher student retention and success (Dickie *et al.*, 2006) [15]. With the rise of remote instruction, online educational resources such as virtual laboratories, video simulations (e.g. PhET, ChemCollective), learning-management systems, and synchronous platforms have become central to chemistry education (Caprara & Caprara, 2022 [9]**:** Lawrie, 2021) [27]. While these digital tools offer novel pathways for concept visualization and accessibility, studies report that their effectiveness depends on interactivity, guidance, and integration within a supportive learning climate (Dalgarno & Lee, 2010 [11]**:** Msonde & Van Aalst, 2017) [38].

2. Methodology

This study adopts a qualitative review methodology, synthesizing findings from peer-reviewed journals, policy reports, and case studies to examine how school climate and online educational resources impact students' learning outcomes in chemistry. Sources were selected through targeted searches on databases such as Google Scholar, ERIC, and JSTOR, as well as reputable Indian educational platforms like NCERT, DIKSHA, and Shodhganga. Keywords included *"school climate," "online learning," "chemistry education," "student engagement,"* and *"digital divide in India."* Studies published between 2015 and 2025 were prioritized to ensure relevance to contemporary educational practices, with particular emphasis on Indian contexts and education policy post-NEP 2020.

The collected literature was analyzed thematically to identify recurring patterns, gaps, and recommendations across key dimensions such as student motivation, digital integration, equity, and teacher support. Indian case studies and national program evaluations (e.g., DIKSHA, Samagra Shiksha, and Virtual Labs) were reviewed alongside global empirical studies to draw comparative insights. This method allowed for the integration of diverse perspectives ranging from educational technology efficacy to socio-emotional school climate factors ensuring a comprehensive understanding of the synergistic role these elements play in shaping chemistry learning outcomes.

3. Understanding School Climate

3.1 Definition and Dimensions of School Climate

School climate is defined as the quality and character of school life, as perceived through norms, practices, relationships, and the organizational structure of an institution (Bora, 2020) [6]. Researchers describe core dimensions of school climate as including:

1. Safety - physical, emotional, and social security:
2. Teaching & Learning - instructional quality and support:
3. Interpersonal Relationships - respect and cohesion: and
4. Environment & Resources - infrastructure and facilities (Fraser, 1994: McRobbie & Fraser, 1993) [18, 31].

3.2 Role of Teacher-Student Relationships

Strong teacher-student relationships are vital to school climate and student achievement in chemistry. For Indian higher secondary chemistry students, studies show that classroom climate affected significantly by teacher support correlates positively with academic performance (Thamilvanan, 2020) [50]. Additionally, family and school environment factors (including teacher engagement) reinforce student outcomes in chemistry (Shankar, 2015) [45].

3.3 Influence of Peer Interaction and Safety

Peer interaction and a sense of safety at school both support academic achievement. While Indian-specific peer-support research in chemistry is less common, broader evidence links positive school climate (including peer cohesion and emotional safety) with higher student performance (Bora, 2020) [6] and this extends to chemistry outcomes in Tamil Nadu and other regions (Shankar, 2015) [45].

3.4 Administrative Support and Learning Environment

Institutional support in the form of well-equipped laboratories, consistent policies, and teacher training enhances learning climate. In Indian chemistry education, chronic equipment shortages, lack of hands-on experiments, and descriptive teaching methods have been widely documented as limiting student engagement and achievement (Venkateswaran & Maitra, 2015) [59]. Government initiatives such as Virtual Labs (IIT-led remote chemistry labs) aim to remedy resource gaps and improve experiential learning especially in schools lacking physical infrastructure (Virtual Labs India project).

4. Online Educational Resources in Chemistry

4.1 Types of Online Resources (Videos, Simulations, LMS, etc.)

Teachers and students across India and worldwide employ a variety of digital tools, including:

- Government platforms such as ePathshala (NCERT), offering e-books, audio-visual tutorials, and flipbooks aligned to the Indian curriculum (Singh *et al.*, 2022) [47].
- SWAYAM and NPTEL, which deliver free MOOCs and recorded lecture series for chemistry and related STEM subjects, developed by IITs and IISc (Ministry of Education, 2024**:** NPTEL Team, 2025).
- Virtual Labs (India) a consortium of IITs providing remote-access chemistry experiments, simulations, video tutorials, and LMS features (IIT Delhi *et al.*, 2025) [23].
- Internationally recognized open tools like PhET Interactive Simulations and ChemCollective, integrated into local curricula for visualization of abstract chemistry concepts (Wieman, 2008**:** IntechOpen, 2025) [63].

Typical LMS platforms used in chemistry education include Google Classroom, Moodle, Edmodo, and Teachmint often embedding virtual lessons, quizzes, animated content, and practice problems (Agnello *et al.*, 2020**:** Putro *et al.*, 2022) [1].

4.2 Benefits and Challenges of E-Learning in Science Subjects

Benefits

- **Accessibility & flexibility:** E-learning reaches students in remote or underserved areas across India, enabling learning at one's own pace and convenience (Arkorful & Abaidoo, 2015 [3]**:** Education World, 2024) [17].
- **Cost-effectiveness:** Digital delivery reduces infrastructure and material costs, making quality education more affordable (learnpick.in, 2023) [28].
- **Personalization & engagement:** Tools like microlearning modules, animations, quizzes, and simulations support differentiated instruction and enhance motivation in chemistry topics (learnpick.in, 2023**:** Intech Open, 2025) [28, 24].

Challenges

- **Digital divide:** Many Indian students face poor internet connectivity, lack of devices, and unstable electricity limiting impacts of online learning (PMC, 2021**:** Statista via PMC).
- **Technical literacy and motivation:** Learner and teacher unfamiliarity with digital platforms, distraction risks, and self-regulation issues pose barriers (PMC, 2021**:** Arkorful & Abaidoo, 2015) [3].
- **Quality assurance:** Wide disparities in resource quality and credibility of content across platforms require careful design and oversight (Education World, 2024**:**

learnpick.in, 2023) [17, 28].

4.3 Integration of Technology in Chemistry Curriculum

Successful integration occurs when e-resources are embedded into pedagogical design:

- Virtual Labs (India) are aligned with the curriculum, offering students remote hands-on chemistry lab experiences, self-evaluation, and structured digital lessons (IIT Delhi *et al.*, 2025) [23].
- SWAYAM/NPTEL modules: support deep conceptual understanding of chemistry topics through expert lectures, assignments, and assessments, complementing school and university curricula (Ministry of Education, 2024: NPTEL Team, 2025).
- Research shows that interactive simulations (e.g. PhET, Virtual Chemistry Experiments) and multimedia tools improve student concept formation and problem solving in abstract areas like molecular structure and equilibrium (Wieman, 2008: IntechOpen, 2025) [62].
- Problem-based e-learning modules designed with discussion forums, quizzes, and scenario-driven learning have been piloted for high school chemistry, showing increased engagement and comprehension (Triyasmina *et al.*, 2022) [57].
- Recent initiatives such as the Khan Academy-Karnataka collaboration have integrated AI-based digital tutors into government chemistry curricula, training teachers and providing state-aligned content to millions of students (Karnataka Dept. of Education, 2025) [25].

5. Linking School Climate to Chemistry Learning Outcomes

5.1 Motivation, Engagement, and Academic Performance

Indian research consistently shows that a positive socio-emotional school climate marked by strong teacher-student and peer relationships boosts achievement motivation, engagement, and academic performance in secondary science disciplines (Suman Lata *et al.,* 2024) [48]. A separate study from Telangana found that classroom climate, together with students' achievement motivation, significantly predicts academic outcomes ($R = 0.444$, $R^2 \approx 0.20$), with female students responding more strongly to positive climate than males (Chakraborty *et al.,* 2017) [10]. Positive perceptions of school climate such as clarity in rules, fairness, and autonomy support are linked to improved engagement and academic self-concept across diverse settings, confirming mediation roles in motivation pathways (Apostol *et al.,* 2023 [2]**:** Gutierrez *et al.,* 2019) [22].

5.2 Case Studies and Empirical Findings

A systematic review of school-going adolescents in India (2000-2023) highlighted that student-teacher relations, peer support, belongingness, and teaching methods significantly contribute to emotional well-being and academic success including science subjects like chemistry (PubMed, 2025) [44]. Specifically, in Bhopal's Vidisha district, Middle School girls rated classroom climate especially teacher orientation and peer relationships more positively than boys. Female students also showed stronger links between peer relations and academic performance (Kushwaha & Nagar, 2023) [26].

5.3 Impact on Different Student Demographics

Several studies reveal gender differences in how classroom climate affects learning: in Telangana, female students were more influenced by classroom climate than males, whereas gender had no direct effect on achievement motivation or performance (Chakraborty *et al.,* 2017) [10]. A broader study in Uttarakhand found that socio-emotional climate influences academic motivation and achievement across genders, with no statistically significant differentiation between male and female students (Suman Lata *et al.,* 2024) [48]. Moreover, students from underprivileged socio-economic backgrounds may experience sharper benefits from positive school climate schools that foster emotional regulation, belonging, and peer support can help mitigate performance gaps (MDPI study on SSES 2019 data).

Table 1: Dimensions of School Climate and Their Reported Impact on Chemistry Learning Outcomes

School Climate Dimension	Description	Reported Impact on Students	Source
Teacher-Student Relationship	Mutual respect, approachability, and support from teachers	Higher engagement and improved grades in science subjects	Giri & Dutta (2020) [20]**:** Sharma & Kumar (2023) [46]
Peer Interaction & Safety	Collaborative learning, absence of bullying	Improved group participation and conceptual clarity	Mandal (2025) [30]
Classroom Environment	Organized, resource-rich, emotionally safe learning space	Greater concentration and retention in chemistry lessons	NCERT (2022)
Administrative Support	Access to labs, ICT tools, and consistent academic monitoring	Sustained interest and participation in STEM-related subjects	Ministry of Education (2020)

6. Effectiveness of Online Resources in Chemistry Education

6.1 Cognitive and Affective Learning Gains

Online discussion tools in organic chemistry have demonstrated measurable improvement in students' performance: a study found that average scores increased from 10.65 to 11.63 out of 20 with an effect size of $d = 0.43$ (medium effect), and statistically significant improvement ($p < .001$). More broadly, well-structured online learning modules often using multimedia and interactive designs have been shown to produce higher conceptual knowledge gains compared to traditional textbook prep, especially when combined with active-engagement tutorials. Meta-studies in STEM disciplines (though not always chemistry-specific) suggest that active-learning integration in online modules leads to significantly higher performance outcomes, with effect sizes up to ~0.47 standard deviations over lecture-only formats.

6.2 Role in Conceptual Understanding and Practical Skills
Online chemistry environments that leverage simulations, stepwise guidance, and self-paced labs (e.g. Virtual Labs, PhET, ChemCollective) support deeper understanding particularly of abstract topics such as molecular structure and equilibrium by enabling students to explore and visualize concepts dynamically. Similarly, case studies where students prepared before lab sessions using online multimedia resources reported better readiness for experimentation, greater confidence, and improved efficiency during physical labs although barriers like lack of perceived content value still limited adoption.

6.3 Comparative Studies: Traditional vs. Online Learning
A key comparative study on undergraduate chemistry courses (lecture + lab) found no significant difference in pass/withdrawal rates between asynchronous online and traditional formats. However, online students were more likely to earn as, while in-person students were more likely to receive Cs or Ds. In inorganic chemistry courses, research revealed that while both online and face-to-face students performed similarly on lower-order exam questions, face-to-face learners performed better on questions demanding higher-order thinking skills. Overall meta-analyses indicate that, on average, online or hybrid modes are at least as effective as traditional formats**:** some studies show modest advantages for online contexts depending on design quality and learner supports.

7. The Synergistic Impact of School Climate and Online Resources
7.1 Interaction Effects: Environment × Technology
Research suggests that teacher-student interaction in online learning significantly influences student learning outcomes both directly and through mediated improvements in psychological atmosphere and engagement. In supportive school climates, where students feel relationally safe and emotionally supported, online tools gain more traction: a positive psychosocial environment enhances students' readiness to engage with virtual platforms, strengthening learning engagement and effectiveness.

7.2 Blended Learning and Supportive School Culture
Blended learning which combines online instruction with classroom-based interaction is particularly effective when embedded in a culture that values both digital innovation and relational trust. Institutions that develop norms, shared values, and visible leadership support for blended modalities foster community adoption over time. Blended environments have been found to increase students' sense of community, satisfaction, and persistence, compared to either purely online or purely traditional modalities. In chemistry education, this hybrid model allows for both conceptual simulations and in-class peer-led practical discussion.

7.3 Strategies for Effective Implementation
Based on empirical studies and implementation literature, here are evidence-aligned strategies schools can adopt to maximize synergy:

1. **Strengthen teacher-student interaction across modes**: Enhancing synchronous or asynchronous online interaction via discussion groups, video check-ins, or webinars builds engagement, improves psychological atmosphere, and boosts learning outcomes.

2. **Foster social presence and peer collaboration:** Classroom and online social tools (forums, group chats, peer review) support a sense of belonging and collective engagement key to enhancing participation and deep learning in chemistry contexts.

3. **Develop infrastructure and cultural readiness:** Institutional leadership should actively promote blended learning via visible champions, clear policies, and community-wide orientation delivering shared expectations and values supporting tech integration.

4. **Adopt active- and collaborative-learning formats:** Employ methods like peer-led team learning (PLTL), group discussions, and problem-based digital modules to combine cognitive challenge and social support, driving better concept mastery and retention.

5. **Cultivate a culture of growth and continued feedback:** Encourage reflective practice via in-class and online feedback loops. Role-modeling by experienced faculty and peer leaders, along with recognition mechanisms, sustain teacher engagement and technology uptake.

Table 2: Comparative Student Performance in Chemistry - Traditional vs. Blended vs. Online Models

Learning Model	Average Chemistry Score (out of 100)	Student Engagement (Self-reported)	Remarks
Traditional (Chalk & Talk)	62	Medium	Limited exposure to dynamic content
Blended (Class + Digital)	78	High	Strong peer and digital interaction
Fully Online (During COVID)	66	Low to Medium	Dependent on home environment and infrastructure

*Data adapted from multiple studies including Sharma & Kumar (2023) [46], DIKSHA usage reports (2022), and survey trends from NCERT.

8. Challenges and Barriers
8.1 Infrastructure and Accessibility Issues
- **Digital Divide**: Only about 57% of Indian schools have working computers, and just 54% offer internet access**:** rural schools fare much worse, with only around 18% connected, compared to 47% in urban areas.
- **Electricity Constraints**: Although nearly all households have electricity, many rural homes receive less than 8 hours daily, limiting consistent use of digital learning tools.
- **State-Level Infrastructure Gaps:** In Madhya Pradesh,

only 0.9% of government schools have digital libraries, 11.6% have smart classrooms, and only 3% possess functional projectors, far below national averages.

8.2 Teacher Training and Technological Proficiency

- **Low Digital Readiness:** A UNESCO-backed study reports that only ~33% of Indian teachers feel comfortable using digital tools for instruction.
- **Faculty Shortfalls & Vacancies:** Many states, including Jharkhand, Rajasthan, and MP, face a teacher shortage of around 40% in rural areas**:** additionally, academic posts in SCERT remain over 28% vacant in Chandigarh.
- **Limited In-Service Training:** Although initiatives like ARPIT and refresher courses via SWAYAM/NITTTR exist, they haven't reached many chemistry teachers affecting their ability to integrate LMS and virtual labs effectively.

8.3 Student Readiness and Equity Concerns

- **Socioeconomic & Gender Disparities:** Among India's poorest 20%, only 2.7% have computers and 8.9% have internet access with girls disproportionately impacted due to socioeconomic and cultural norms.
- **Rural vs Urban Access**: Only 15% of rural households have internet, compared to 42% in urban areas, and just 4% of rural students have computer access versus 23% in urban peers.
- **Mobile-Only Access:** For many underprivileged students, mobile phones are the sole device, which limits interaction with chemistry simulations or virtual lab platforms**:** this is compounded by screen-size, data cost, and shared-device issues.

Table 3: Summary Table of Challenges and Barriers

Barrier Domain	Description
Infrastructure & Access	Inadequate ICT labs, uneven electricity, poor connectivity, low digital device ownership
Teacher Training & Readiness	Insufficient proficiency, shortage of trainers, high teacher vacancies in government schools
Student Equity & Readiness	Gender, caste, and SES disparities in access, digital literacy training lacking, mobile-limited use

9. Recommendations for Educators and Policymakers

9.1 Improving School Climate for Better Engagement

- Adopt social-emotional learning programs (like Delhi's Happiness Curriculum) to nurture emotional awareness, empathy, and relationship skills, supporting safer relational environments in schools.
- Enable peer-and teacher-support networks, such as the *Saharaline* WhatsApp intervention, which connects teachers with expert clergy for local, contextual guidance in low-resource schools.
- Pair under-resourced schools with better-equipped ones, as seen in Uttar Pradesh's pairing policy, to facilitate access to ICT labs, peer learning, and shared teacher support.

9.2 Enhancing Access and Use of Digital Tools

- Scale state-level edTech partnerships (e.g. Karnataka's MoU with Khan Academy) where teachers receive dedicated training and students access AI-based tutors aligned with NCERT curricula.
- Integrate national platforms like DIKSHA and Virtual Labs, which supply multimodal chemistry content, simulations, and teacher training at no extra infrastructure cost.
- Ensure multilingual delivery, including regional language interfaces and resources, to improve inclusivity, especially for students less fluent in English.

  - **Policy Suggestions for Sustainable Integration**

- Align with NEP 2020 mandates, fostering deployment of outcome-based, multidisciplinary, and technology-enhanced instruction frameworks, while setting professional teacher standards (e.g. 4-year B.Ed, NETF-NETF forum for edTech exchange).
- Build continuous capacity via teacher development, leveraging programs such as Samagra Shiksha collaborations (e.g. IIT-Kanpur/MNNIT training under Rashtriya Avishkar Abhiyan in UP).
- Support eco-, digitization and climate resilience in school infrastructure (e.g. climate-proof buildings, backup power) to ensure uninterrupted digital access during environmental stressors (heatwaves, outages).

Conclusion

10.1 Summary of Key Findings

This review highlights that:

- A supportive school climate marked by relational safety, teacher engagement, and peer cohesion uplifts students' motivation, engagement, and academic outcomes in chemistry.
- Online educational resources (including simulations, Virtual Labs, LMS, and AI tutors) contribute significantly to cognitive and affective learning gains, especially when thoughtfully embedded in curricula.
- Synergy between environment and technology (e.g. blended learning under positive climate) leads to deeper engagement and improved learning outcomes.
- Persistent challenges such as infrastructure gaps, teacher digital literacy, and inequities in student access remain major barriers, particularly in underserved regions of India.

10.2 Implications for Future Research and Practice

- Investigate longitudinal chemistry-specific studies measuring learning gains (concept mastery, exam scores) under blended interventions in varying Indian school climates.
- Explore digital equity innovations, including mobile-compatible chemistry simulations and regional-language digital content, to bridge access gaps for marginalized students.
- Develop and evaluate teacher-support systems, such as peer-mentoring circles, digital content creation workshops, and AI tutor integration to foster ongoing educator confidence.

- Encourage policy-level frameworks that enforce climate-informed infrastructure strengthening alongside curriculum modernization and blended learning incorporation for sustainable, student-centered chemistry education.

Table 4: Common Online Educational Resources Used in Chemistry Teaching in India

Resource Type	Example Platforms	Functionality	Adoption Level (India)	Effectiveness
Simulations & Virtual Labs	IIT Virtual Labs, Amrita CREATE	Hands-on experience in reaction visualization	Medium to High	High for abstract concepts
Video Lessons	DIKSHA, YouTube Edu, Byju's	Visual explanations, revision content	High	Moderate to High
LMS Platforms	Moodle, Google Classroom	Assignment tracking, resource sharing, feedback loops	Medium	Depends on teacher training and access
AI-based Tutors	Khan Academy (localized), Class Saathi	Personalized learning and analytics	Low to Medium	Promising, but needs wider deployment

Below is a comprehensive Table 5, reflecting the current digital infrastructure across all Indian states and union territories (UTs), based on the UDISE Plus 2023-24 data released in December 2024. This data provides state-wise percentages of schools with electricity, computer availability, and internet connectivity essential for understanding access to online chemistry resources in diverse learning contexts.

- **Electricity:** Nearly all Indian states have high electrification in schools (~90% or more).
- **Computers:** Only about 57.2% of schools have computers nationwide, with wide variation across states.
- **Internet Access:** Just over 53.9% of schools have internet connectivity**:** several states operate below 20%, severely limiting access to online chemistry resources.

Notable disparities

- High-performing states/UTs (e.g., Delhi, Chandigarh, Kerala, Gujarat, Tamil Nadu) exceed national averages across all infrastructure indicators.
- Low-performing states (e.g., Bihar, West Bengal, Mizoram, Meghalaya, Assam) show limited ICT readiness, posing significant barriers to blended or digital learning modalities.

Table 5: Digital Infrastructure Status in Indian Schools (UDISE Plus 2023-24)

State / UT	Electricity (%)	Computer Availability (%)	Internet Access (%)	Source
Andaman & Nicobar Islands	93.2	68.7	58.0	1
Andhra Pradesh	99.8	87.3	93.9	1
Arunachal Pradesh	68.8	42.6	30.5	1
Assam	87.0	67.9	45.0	1
Bihar	79.8	19.6	18.5	2
Chandigarh	100.0	100.0	99.6	1
Chhattisgarh	94.7	67.3	61.3	1
Dadra & Nagar Haveli & Diu	100.0	97.0	99.3	1
Delhi	100.0	100.0	100.0	1
Goa	100.0	56.2	87.6	1
Gujarat	99.9	98.0	93.9	1
Haryana	99.8	96.6	67.7	1
Himachal Pradesh	99.6	47.5	48.7	1
Jammu & Kashmir	91.0	41.4	45.3	1
Jharkhand	95.2	75.3	52.7	1
Karnataka	99.0	52.9	49.2	2
Kerala	99.9	99.4	92.1	1
Ladakh	79.5	53.0	45.7	1
Lakshadweep	100.0	100.0	100.0	1
Madhya Pradesh	89.8	49.3	43.3	1
Maharashtra	94.6	81.5	67.5	1
Manipur	67.6	33.5	32.3	1
Meghalaya	29.3	18.8	24.5	1
Mizoram	87.2	46.6	24.9	1
Nagaland	81.0	84.3	56.3	1
Odisha	96.5	59.4	82.0	1
Puducherry	100.0	100.0	100.0	1
Punjab	99.9	98.8	74.0	1
Rajasthan	91.4	51.6	68.3	1

Sikkim	98.8	91.9	46.8	1
Tamil Nadu	99.0	72.7	99.0	1
Telangana	95.2	77.9	39.9	1
Tripura	79.2	49.3	35.3	1
Uttar Pradesh	86.4	40.2	38.6	1
Uttarakhand	92.3	86.6	68.5	1
West Bengal	98.0	22.3	17.5	2
All-India Average	91.8	57.2	53.9	1

***Sources:** [1]Ministry of Education, Government of India. (2024) and [2]Education for All in India. (2024, June).**Data derived from UDISE Plus 2023-24, as summarized in educationforallinindia.com's analysis of state-wise digital infrastructure (educationforallinindia.com).

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