

Digital Literacy and Access to Online Education in Rural Maharashtra: A Study of Learner Experiences and Infrastructural Gaps

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Abstract

The rapid expansion of online education in India following the COVID-19 pandemic has been celebrated as a democratising force—yet evidence from rural and semi-urban contexts suggests that the 'digital divide' remains a profound structural barrier to equitable learning. This paper examines digital literacy levels, device ownership, connectivity access, and learner experience of online education among students in rural Maharashtra, focusing on three districts: Nandurbar (tribal-dominated, highly marginalised), Osmanabad (drought-prone, backward region), and Wardha (semi-urban, historically better served). A survey-based study involving 380 school and college-level students, combined with community-level observation and 15 teacher interviews, reveals significant intra-state disparities. While 71.4% of students in Wardha reported regular internet access, only 29.2% in Nandurbar and 38.6% in Osmanabad could say the same. Digital literacy scores, measured through a validated 20-item scale, showed that fewer than 30% of rural students across all districts met the basic digital competency threshold defined by the NASSCOM Foundation. The study also examines the Maharashtra government's Shiksha Setu initiative and PM eVIDYA programme's implementation fidelity and learner uptake, identifying gaps between policy intent and ground reality. Recommendations address device access, teacher training, and curriculum redesign.

Keywords: *Digital Literacy, Online Education, Rural Maharashtra, Digital Divide, E-Learning Access, Educational Technology, PM eVIDYA*

1. Introduction

The Indian government's response to the pandemic-induced closure of educational institutions was, in part, a large-scale pivot to online learning. The PM eVIDYA programme, launched in May 2020, promised 'multi-mode' access to quality digital education, and the SWAYAM platform's MOOC expansion aimed to bring higher education to remote corners of the country. Maharashtra's education department launched the Shiksha Setu programme and partnered with telecom providers to offer subsidised data access to students. These were

commendable initiatives—but they rested on an assumption of digital readiness that, as this study and others document, was far from universal.

Maharashtra is India's second most populous state and one of its economically advanced ones, yet it harbours some of the country's most acute inter-regional inequalities. The Vidarbha and Marathwada regions—encompassing districts such as Nandurbar, Osmanabad (renamed Dharashiv), and Yavatmal—consistently rank among the lowest in India on composite development indices, including educational attainment. The contrast with the Pune-Mumbai corridor creates a state-within-a-state dynamic that makes uniform digital education policy both politically convenient and empirically misleading.

This study is motivated by a recognition that digital literacy—the ability to access, evaluate, and create information using digital technologies—is a prerequisite for meaningful participation in online education, not merely a desirable add-on. Without baseline digital competency, even perfect internet access does not translate into effective learning. Understanding both dimensions—access and literacy—is therefore essential for evidence-based policy design.

2. Literature Review

The concept of the 'digital divide' was initially theorised in the late 1990s as a binary gap between those who have internet access and those who do not (DiMaggio et al., 2001). Subsequent scholarship has moved toward a 'second-level' divide that emphasises differences in skills, motivation, and usage patterns—even among those with notional access (Hargittai, 2002). Both dimensions are relevant to the Maharashtra context.

ASER (Annual Status of Education Report) data has been the primary empirical source for tracking rural education outcomes in India. The ASER Rural 2022 report found that nationally, only 26.4% of Class 8 students in rural India could read a simple English sentence, while digital learning competency measures were even more sobering. For Maharashtra specifically, ASER 2022 noted that 41.3% of rural children had access to a smartphone at home, but only 18.7% had used it for educational purposes.

Kumar and Joshi (2022) in the *Journal of Educational Technology and Society* studied e-learning adoption during COVID in Maharashtra's Aurangabad division and found that students from Scheduled Tribe backgrounds were 2.4 times more likely to have dropped out of digital schooling within the first month compared to general category students, primarily due to device constraints. The UGC's report on Digital Education in Higher Education Institutions (2022) echoed similar concerns at the collegiate level, flagging that 62% of colleges in Maharashtra's rural areas lacked dedicated computer laboratories with functional internet.

The National Education Policy 2020 (Ministry of Education, 2020) explicitly identifies digital literacy as a foundational skill and calls for a dedicated National Digital Literacy Programme. However, implementation frameworks at the state level remain nascent. Maharashtra's ICT education policy under Samagra Shiksha Abhiyan has focused primarily on hardware provision—distributing tablets and connecting schools under BharatNet Phase II—without equivalent investment in teacher digital competency or curriculum redesign.

3. Methodology

This study uses a convergent mixed-methods design. Quantitative data was collected through a structured survey administered to 380 students (190 at school level, Class 9–12; 190 at college level, First and Second Year) across the three districts between July and October 2025. Schools and colleges were selected through stratified random sampling, including government schools and aided colleges in each district.

Digital literacy was assessed using a 20-item scale based on the DigComp 2.1 framework (European Commission, 2017), adapted for the Indian rural context and validated

through expert review and pilot testing with 40 students in Nashik district. The scale covers five competency areas: information and data literacy, communication and collaboration, digital content creation, safety, and problem-solving. Scores below 50% were classified as low literacy; 50–74% as moderate; 75%+ as high.

Connectivity was assessed through a 12-item access inventory covering device ownership (personal vs. shared), type of internet connection (broadband, mobile data, none), average data plan cost, and frequency and quality of connectivity. Teacher interviews (15, conducted in Marathi and English) explored digital teaching practices, professional development, and student readiness perceptions.

Observations at 6 community cyber centres (CSCs) across the three districts documented actual usage patterns and service quality. Data analysis employed SPSS v.25 for quantitative data, with independent samples t-tests and chi-square tests for group comparisons. Thematic coding was applied to interview transcripts.

4. Results and Observations

Digital literacy scores showed that only 28.4% of the total sample met the minimum competency threshold (score $\geq 50\%$). District-wise variation was significant: 42.1% in Wardha met the threshold vs. 22.3% in Osmanabad and 18.1% in Nandurbar. At the sub-scale level, 'information and data literacy'—the most familiar digital skill—showed the highest scores (mean: 48.3%), while 'digital content creation' was the weakest (mean: 22.7%), suggesting students can consume but not produce digital content.

Internet access was highly device-dependent. 79.6% of students reported accessing the internet exclusively via a shared family smartphone; only 14.7% had personal devices. Fixed broadband penetration was negligible in Nandurbar (3.2%) and Osmanabad (7.4%). Average daily internet usage for educational purposes was 23 minutes in Nandurbar vs. 51 minutes in Wardha, a difference that is statistically significant ($p < 0.001$) and educationally consequential.

Regarding PM eVIDYA, 56.3% of students had heard of the programme, but only 19.4% had actively used its platforms (DIKSHA app, DTH educational channels). Shiksha Setu awareness was even lower at 31.2%. Teacher interviews revealed that 11 of 15 teachers had received no formal training in digital pedagogy. Common complaints included: unreliable school internet connections (described as 'working 2–3 days a week'), absence of Marathi-medium digital content for lower-grade subjects, and lack of technical support for device maintenance.

CSC observations found that while Common Service Centres were theoretically positioned as digital access points, they were primarily used for government scheme applications and certificate downloads—their potential as learning infrastructure was largely unrealised due to limited hours, absence of dedicated education staff, and low digital literacy among local CSC operators.

5. Discussion

The data affirm that the optimism surrounding Maharashtra's digital education expansion has been premature, particularly for its most marginalised districts. The gap between Wardha and Nandurbar in digital literacy and access is not merely a technology gap—it reflects deeper social fissures of tribe, caste, gender, and class that digital interventions alone cannot address.

The finding that content creation skills are weakest is particularly relevant to the NEP 2020's competency-based learning vision, which emphasises active knowledge construction over passive consumption. If students cannot create, curate, or critically evaluate digital content, they remain passive consumers of whatever content is provided to them—a far cry from the digitally empowered learner envisioned by national policy.

Teacher capacity is a critical choke point. Internationally, research by OECD (2021) and domestically by Tatto et al. (2020) confirms that teacher digital proficiency is the strongest predictor of student digital learning outcomes. Maharashtra's teacher professional development investment in digital pedagogy has been insufficient and inconsistent. The BharatNet infrastructure buildout—however welcome—cannot be leveraged without parallel investment in human capital.

The underutilisation of CSCs for educational purposes represents a missed opportunity. Comparative evidence from Karnataka's Bhoomi Kendras and Rajasthan's Jan Sochna Portals suggests that multi-purpose service centres can serve educational functions when adequate staffing, curriculum materials, and community trust are in place—conditions that Maharashtra has not yet systematically cultivated.

6. Conclusion

Digital education in rural Maharashtra is constrained not by a single failure but by a constellation of interrelated deficits—in infrastructure, digital literacy, teacher capacity, content, and policy coordination. Bridging these gaps requires a long-term, multifaceted commitment that goes beyond hardware distribution.

This study recommends: (a) mandatory digital literacy testing as part of school and college admission processes to identify baseline deficits and enable targeted remediation; (b) a dedicated Maharashtra Digital Teachers' Corps, providing structured 30-hour professional development in digital pedagogy for all government school teachers by 2027; (c) expansion of Marathi-medium digital content through state partnerships with MSCERT; (d) repurposing CSCs as 'Shiksha Kendras' with dedicated educational coordinators in backward districts; and (e) community tablet libraries—device-sharing infrastructure maintained at gram panchayat level—to address personal device deficits in tribal and remote villages.

The promise of digital education as an equaliser cannot be realised through technology alone. It demands investment in the human, social, and linguistic dimensions of learning that continue to determine who benefits from the digital revolution and who is left behind.

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