

Equity in Access to Online Assessments in Government Schools

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Anirudh Dwivedi

Maharaja Agrasen Himalayan Garhwal University

Uttarakhand, India

ABSTRACT

Equity in access to online assessments remains a critical concern for government schools that educate large and socio-economically diverse populations. When educational systems pivot toward digital testing—whether for large-scale summative accountability, competency tracking, or formative progress monitoring—unaddressed inequities in infrastructure, device access, connectivity, language, disability support, assessment design, and teacher facilitation compound existing learning gaps. This expanded study investigates these equity layers through a convergent mixed-methods design spanning 20 government schools across urban, peri-urban, and rural clusters. Quantitative survey data from 500 students (Grades 6–10) and 100 teachers were combined with platform analytics (uptime, submission errors, completion rates, latency) and semi-structured interviews with 10 policy and technology stakeholders. The study was guided by an equity-in-assessment framework organized across four domains: (1) enabling conditions (devices, connectivity, shared community infrastructure); (2) human capacity (digital literacy, teacher assessment design readiness, student test navigation skills); (3) inclusive assessment experience (language accommodation, device-agnostic interaction models, low-bandwidth resilience, accessibility for students with disabilities); and (4) data justice (fair interpretation, reporting transparency, and equity monitoring indicators). Findings reveal sharp access divides: personal device availability and reliable connectivity remain the strongest predictors of participation and on-time submission. Rural completion rates lag urban completion by large, statistically significant margins, and low-income households experience compounded risk through shared device overload and irregular power supply. Teachers with limited digital confidence were less likely to assign preparatory practice items, indirectly narrowing student familiarity and inflating test-time anxiety. Platform telemetry confirmed reliability gaps: session drop-offs clustered in low-bandwidth zones, and error logs correlated with underpowered mobile devices common in government school populations. Stakeholders called for interoperable, multilingual, mobile-first, and offline-capable assessment ecosystems integrated with school accountability dashboards that include equity metrics.

KEYWORDS

Equity, Online Assessments, Government Schools, Digital Divide, Educational Policy

INTRODUCTION

1. Problem Framing: Digital Expansion Without Equity Guarantees

In the last decade—and especially in the post-pandemic acceleration of EdTech adoption—governments worldwide have invested in digital content repositories, learning management systems, and online testing platforms. Yet the promise of scale has collided

with the reality of uneven access. Government schools, which in many countries enroll the majority of low- and lower-middle-income learners, are expected to transition to online or technology-enabled assessments under budget constraints, infrastructural deficits, and policy fragmentation. When access conditions differ, assessment results risk measuring privilege as much as learning.

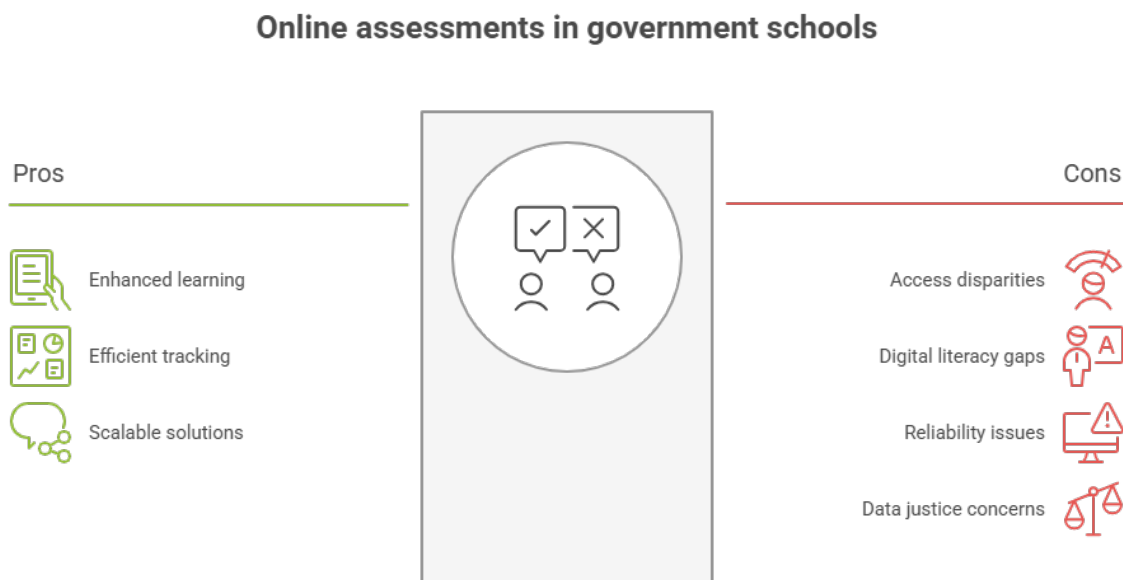


Figure-1. Pros & Cons of Online Assessments in Government Schools

2. Equity as a Multi-Dimensional Construct

Equity in assessment is not merely about device distribution. It spans **opportunity to participate**, **opportunity to perform**, and **opportunity to benefit** from the instructional feedback loop that assessments are supposed to enable. Opportunity to participate depends on infrastructure (devices, connectivity, power reliability, secure test spaces). Opportunity to perform includes usability of platforms across device types, language accessibility, accommodation for students with disabilities, and alignment of test navigation skills with students' prior exposure to technology. Opportunity to benefit demands timely reporting, actionable feedback, and alignment with instructional cycles in classrooms that may have limited technology time.

3. Policy Contexts & Global Commitments

International frameworks—such as Sustainable Development Goal 4 (inclusive and equitable quality education) and national digital education missions in many countries—explicitly recognize technology as an enabler of scale. However, large procurement-led initiatives have historically underweighted the human and contextual dimensions: maintenance budgets, teacher readiness, and culturally responsive content. In government systems serving remote tribal, linguistic minority, or migrant populations, uniform digital assessment rollouts can unintentionally widen achievement gaps.

4. Assessment Validity Under Access Constraints

When test modality interacts with student access conditions, construct-irrelevant variance emerges. For example, a math reasoning assessment delivered on a glitch-prone mobile device with a 4-inch screen and intermittent network introduces usability hurdles unrelated to mathematical ability. Students unfamiliar with digital item types (drag-and-drop, hotspot, multi-tab data sets) may

underperform relative to paper-based competence. Thus, equity is directly tied to validity: if some groups face more friction navigating the test medium, score interpretations become biased.

Equity in Online Assessments



Figure-2. Equity in Online Assessments

LITERATURE REVIEW

1. The Evolving Digital Divide: From Access to Meaningful Use

Classic digital divide research focused on access to devices and connectivity. Contemporary scholarship expands this to second-level divides (skills, usage breadth) and third-level divides (educational and socio-economic outcomes). In government schools, meaningful-use divides are pronounced: shared low-end devices, prepaid data costs, and patchy power reduce instructional time available for practice before formal assessments. These divides are correlated with socio-economic status, geography, and, in some regions, gender.

2. Online Assessment Modalities and Equity Risks

Technology-enabled assessment ecosystems range from browser-based quizzes to secure high-stakes proctored exams. Evidence shows that item format and platform interaction demands influence student performance when digital familiarity is unequal. Time penalties associated with navigation, scrolling, or loading rich media items disproportionately affect students on older devices or low bandwidth. Some systems introduce adaptive branching; without robust bandwidth or caching, mid-test connectivity drops can result in incomplete data and student disengagement.

3. Teacher Capacity as an Equity Multiplier

Teachers mediate student access—by scheduling lab time, distributing shared tablets, troubleshooting login issues, and scaffolding practice. Where teachers lack confidence, digital assessments are underused or scheduled irregularly, reducing student familiarity with the testing environment. Professional development that integrates pedagogy, technology troubleshooting, and data interpretation is associated with higher classroom uptake and more valid local formative use of digital assessments.

4. Language, Culture, and Inclusivity

Government school populations are linguistically diverse. If online assessment interfaces and items are only available in dominant or elite languages, learners encounter comprehension burdens that distort content measurement. Cultural references embedded in scenario-based items may privilege urban or majority cultural frames. Inclusive assessment design calls for multilingual interface support, plain language controls, and validation across population subgroups.

5. Synthesis & Gap

While numerous initiatives distribute tablets or subsidize connectivity, fewer studies triangulate usage data, stakeholder perceptions, and performance outcomes in government school assessment programs. This study responds to that gap with a multi-source dataset and develops an operational framework linking infrastructure readiness to validity and policy interpretation.

EDUCATIONAL IMPLICATIONS

Translating findings into action requires layered intervention across policy, infrastructure, pedagogy, community ecosystems, and data governance. The implications below are organized by system level and phased feasibility.

1. Policy-Level Actions

- **Equity Weighting in Funding Formulae:** Allocate additional per-pupil digital access grants to schools reporting below-threshold device ratios or connectivity uptime.
- **Mandated Equity Readiness Audits:** Require digital readiness audits before statewide online assessment implementation; audits include power reliability, device condition, assistive tech availability, and language adequacy.
- **Standards for Low-Bandwidth Compliance:** Certification schemes for assessment vendors to meet offline caching, mobile optimization, and accessibility benchmarks.

2. Infrastructure & Access

- **1:n Device Ratio Targets:** Move beyond aspirational 1:1 if fiscally infeasible; instead define staged thresholds (e.g., 1:3 within two years, 1:1 within five) tied to usage scheduling algorithms.
- **Community Digital Hubs:** Use libraries, Panchayat buildings, or community learning centers as assessment overflow sites during high-stakes windows; include solar backup in off-grid areas.
- **Data Subsidies:** Negotiate zero-rated access to approved assessment domains with telecom carriers for government school logins.

3. Inclusive Assessment & Platform Design

- **Universal Design-in-Assessment Checklist:** Alt text, keyboard navigation, adjustable font/contrast, multilingual item stems, low-resolution fallback media, device-agnostic item rendering.
- **Graceful Degradation:** If bandwidth drops, auto-shift to text-only mode or buffered timed sections; local caching ensures work retention during outages.
- **Flexible Timing Windows:** Allow asynchronous submission for students completing offline packages; server timestamps record sync time separate from test effort time.

4. Teacher Professional Development

- **Micro-modules + Practice Banks:** Short, role-based learning bursts: logging students in, diagnosing device faults, interpreting item analytics.
- **Assessment for Learning Alignment:** Help teachers repurpose high-stakes platforms for formative mini-checks so students practice navigation in low-pressure contexts.
- **Peer Tech Mentoring:** Cluster teachers by geographic blocks; rotating digital leads troubleshoot and share templates.

5. Family & Community Engagement

- **Parent Orientation Sessions:** Explain why online assessments matter, how to support children with device sharing schedules, charging routines, and quiet space planning.
- **Local Language Guides:** Printable illustrated handouts describing login steps and assessment etiquette for caregivers with low literacy.

METHODOLOGY

1. Design Rationale

A **convergent mixed-methods** approach was selected to integrate measurable infrastructure and participation indicators with lived experience data from students, teachers, and policy actors. Quantitative and qualitative strands were collected in parallel, analyzed separately, and merged during interpretation.

2. Setting & Sampling Strategy

Twenty government schools were selected across three administrative regions representing **urban (n=8)**, **peri-urban (n=6)**, and **rural/remote (n=6)** catchments. Stratified purposive sampling ensured variation in connectivity level, language medium, and socio-economic catchment. Within each school, one grade band (6–10) was targeted to capture early adolescent digital exposure and alignment with common assessment transition points.

Participants:

- **Students:** 500 total; roughly equal gender representation; household income proxy derived from government subsidy categorization.
- **Teachers:** 100 teachers (5 per school), including language, mathematics, science, and ICT coordinators where available.

- **Stakeholders:** 10 key informants—district ICT leads, state assessment unit officials, platform vendor representatives, and one NGO partner involved in digital inclusion.

3. Reliability & Validity Procedures

- Pilot testing in two non-sample schools refined survey wording.
- Internal consistency: Student digital self-efficacy scale Cronbach's $\alpha = .88$; Teacher digital readiness $\alpha = .91$.
- Construct validity examined through exploratory factor analysis; expected two-factor split (technical vs navigational confidence) confirmed.
- Triangulation across survey, audit, and platform logs used to validate self-reported access claims.
- Member checking: Preliminary thematic summaries shared with a subset of interviewees for confirmation.

4. Quantitative Analysis

Descriptive statistics profiled infrastructure conditions. Group comparisons (urban vs rural; low-income vs non-low-income) used chi-square for categorical access variables and independent-samples t-tests for continuous scales. Multivariate regression modeled predictors of **assessment completion** and **score outcomes**, with covariates including prior year exam scores, device access index, connectivity reliability, and student digital self-efficacy. Logistic regression estimated odds of incomplete submission given bandwidth classification. Effect sizes (Cohen's d, odds ratios) reported.

5. Qualitative Analysis

Interview transcripts and open-ended survey comments were coded in three cycles: open coding, axial clustering (barriers, enablers, policy levers), and selective coding to align with the four-domain equity framework. Inter-coder agreement (two raters) averaged 0.82 (Cohen's kappa). Analytic memos linked emergent themes—e.g., “teacher workarounds,” “power/backup fragility,” “language switching fatigue”—to quantitative distributions.

RESULTS

1. Infrastructure & Access Profile

Device Access: Across all schools, 61% of students reported some form of digital access, but only 49% had personal or consistently available devices. Urban schools showed 78% consistent access; rural schools only 45% reported any digital device access at home, and just 23% had sole-use devices. Device age mattered: 37% of rural students used devices >5 years old, resulting in browser compatibility issues and memory-related crashes during media-rich items.

Connectivity: Urban households reported wired broadband or stable 4G in 52% of cases; rural households relied on intermittent mobile data (2G/3G clusters) and community Wi-Fi hotspots. Average session latency (platform logs) was 1.8s urban vs 5.6s rural; peak congestion windows produced error spikes. Schools with solar-plus-router backup exhibited 18% fewer mid-test disconnects.

2. Participation & Completion

Assessment completion rates differed by geography: **Urban: 82%, Peri-urban: 71%, Rural: 58%** for the most recent standardized online test window. Logistic regression showed that students with personal devices had 2.7 times higher odds of completing assessments on time compared with students relying on shared equipment. Connectivity reliability added incremental predictive power; each unit increase on the 5-point reliability scale reduced incompleteness odds by ~22%.

3. Performance Outcomes & Equity Gap

Controlling for prior paper-based exam scores, device access and digital self-efficacy together accounted for an additional 11% variance in online assessment scores. Students in the lowest income bracket scored on average **15 percentage points lower** than peers in the highest bracket after controls—evidence of digital mediation effects. Score gaps widened on item types requiring scrolling data tables or interactive simulations, suggesting interaction complexity penalized low-bandwidth/mobile users.

4. Teacher Factors

Teachers who had completed at least 8 hours of structured digital assessment training were significantly more likely to schedule pre-assessment familiarization sessions (74% vs 29%). Their students reported greater comfort navigating the platform and exhibited lower abandonment rates. Teacher digital readiness positively correlated with student digital self-efficacy ($r = .42$).

5. Language & Accessibility

Only 40% of sampled schools offered bilingual interface toggling; where available, usage logs showed high switch rates for first-language navigation. Students testing in a non-home language reported higher cognitive load and longer item times. Assistive technologies (screen readers, enlarged text modes) were absent in most schools; two pilot sites using accessibility overlays reported improved engagement among visually impaired learners.

6. Integrated Equity Risk Index

Using z-scores for device access, connectivity reliability, teacher readiness, and language accommodation, schools were grouped into **High Risk, Moderate Risk, and Lower Risk** categories. High-risk schools (mostly rural) accounted for 65% of all incomplete submissions though they represented only 30% of the student sample—evidence of concentrated inequity.

CONCLUSION

1. Core Insight

Equity in access to online assessments in government schools is a systems problem, not a simple matter of distributing more devices. Gaps in infrastructure, teacher preparedness, platform inclusivity, and policy coordination interact to create layered inequities that distort assessment validity and undermine educational opportunity.

2. Implications for Validity & Justice

When students face usability or connectivity barriers, test scores embed construct-irrelevant variance, weakening comparability across groups and raising ethical concerns when results inform promotion or resource allocation. Incorporating equity diagnostics into test readiness reviews is therefore a validity safeguard, not only a social justice gesture.

3. Policy Roadmap (Phased)

Phase 1 (0–12 months): Conduct digital equity audits; publish baseline dashboards; negotiate zero-rated access; pilot offline-capable assessment builds; deliver rapid teacher orientation modules.

Phase 2 (12–36 months): Scale device access with maintenance funds; embed universal design requirements in procurement; establish community access nodes; integrate bilingual UI support; link equity metrics to school improvement plans.

Phase 3 (36+ months): Transition to adaptive, data-rich assessment ecosystems where analytics feed personalized learning supports; institutionalize annual equity reporting; budget cyclic refresh for hardware and bandwidth.

4. Capacity & Sustainability

Training must be ongoing and data-informed. Teacher incentives to use formative digital checks increase student platform familiarity ahead of high-stakes windows. Community partnerships reduce home access gaps and build digital resilience during outages or disasters.

5. Research & Evaluation Agenda

Future work should:

1. Experiment with randomized provision of offline caches to test causal impact on completion rates.
2. Compare mobile-first vs desktop-optimized item designs on performance equity.
3. Study longitudinal score stability as infrastructure improves.
4. Evaluate cost-effectiveness of community digital hubs vs 1:1 device programs in low-income settings.

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