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Digital Communication and Content-Based Teaching in Indian Government Schools: A Secondary-Data Review of Access, Teacher Readiness, and Learning Outcomes

Vimlendra Shekhar Singh, Assistant Professor, Sanjeev Agrawal Global Educational University

Dr. Vanya Chaturvedi, Head of Department, Sanjeev Agrawal Global Educational University

Abstract

Digital content-based teaching has emerged as a central strategy for improving access, engagement, and learning outcomes in India's government school system, particularly following the disruptions caused by the COVID-19 pandemic and the policy push of the National Education Policy (NEP) 2020. This paper adopts a secondary-data, desk-review methodology to examine the current state of digital content-based teaching practices in Indian government schools. Drawing on government reports, national platforms such as DIKSHA and SWAYAM, large-scale household surveys such as the Annual Status of Education Report (ASER), and peer-reviewed studies, the paper synthesises evidence on policy design, infrastructure and access, teacher readiness, pedagogical practice, and learning outcomes. The review finds that while national digital infrastructure has expanded rapidly and teacher attitudes toward Information and Communication Technology (ICT) are broadly positive, persistent gaps in device access, connectivity, teacher training, and content localisation continue to limit the effectiveness of digital content-based teaching, particularly in rural and economically disadvantaged contexts. The paper concludes with an integrated framework of findings and policy-relevant recommendations for strengthening digital pedagogy in government schools, and identifies directions for future primary research.

Keywords: *Digital Educational Communication; Digital Content-Based Teaching; Government Schools; India; ICT Integration; DIKSHA; Digital Divide; Secondary-Data Review*

1. Introduction

Education systems worldwide have undergone a decisive shift toward digital modes of content delivery over the last decade, and India's government school system the largest public school network in the world has been no exception. Digital content-based teaching, understood broadly as the use of multimedia, interactive, and internet- or device-mediated instructional material to support classroom or remote learning, has moved from the margins of Indian education policy to its centre. This shift has been driven by a combination of factors: the Digital India programme, the National Education Policy (NEP) 2020, the proliferation of low-cost smartphones and mobile data, and, decisively, the school closures necessitated by the COVID-19 pandemic between 2020 and 2022.

Government schools in India serve the overwhelming majority of children from low- and middle-income

households, first-generation learners, and historically marginalised communities. Understanding how digital content-based teaching is designed, delivered, and received within this system is therefore not merely a technical or administrative question but one with direct implications for educational equity. Flagship national platforms such as DIKSHA (Digital Infrastructure for Knowledge Sharing), SWAYAM, PM eVidya, SWAYAM Prabha, and e-Pathshala were established to provide curriculum-aligned content, teacher training modules, and multimodal access pathways including television, radio, and QR-coded textbooks so as to reach learners even where broadband connectivity is limited.

At the same time, a substantial body of survey and field evidence most notably the Annual Status of Education Report (ASER) points to continuing disparities in device ownership, digital literacy, and actual use of digital tools for learning as opposed to entertainment or social media, with these disparities falling disproportionately on rural households, girls, and children from low-income families. The COVID-19 pandemic sharpened this picture considerably: while digital and remote learning became the default mode of instruction for an extended period, evidence from national and state-level studies indicates substantial learning loss in foundational literacy and numeracy, with the sharpest declines recorded among children with the least access to devices, connectivity, and parental support.

Against this backdrop, this paper undertakes a structured review of secondary data and published literature to examine the current landscape of digital content-based teaching in India's government schools. Rather than generating new primary data, the paper synthesises existing government reports, national survey data, and peer-reviewed research to

build an evidence-based account of what is known about policy design, infrastructure, teacher capacity, pedagogical practice, and outcomes, and to identify the gaps that future primary research including the author's own doctoral work might usefully address.

1.1 Research Gap

Although digital education in India has received considerable policy and scholarly attention, important gaps remain in the evidence base. Existing work commonly addresses device access, internet connectivity, digital platforms, teacher attitudes, or pandemic-related learning loss as separate issues. Far fewer studies synthesise how these factors operate together in government schools, where the educational value of a digital resource depends on infrastructure, teachers' digital-pedagogical capacity, students' opportunities to participate, and the quality of teacher-student communication.

A further gap concerns the communication dimension of digital teaching. The availability of DIKSHA, SWAYAM, e-Pathshala, or PM eVidya does not by itself show whether digital content supports explanation, interaction, feedback, clarification, participation, or formative assessment in classrooms and homes. National surveys provide essential evidence on access and use, but they offer limited insight into classroom-level communication practices; meanwhile, many teacher studies are restricted to individual states or districts. Consequently, there is a need for an integrated review that connects policy, access, teacher readiness, pedagogical communication, content design, and learning outcomes in Indian government schools.

This review addresses that need by synthesising secondary evidence across these interconnected domains. It does not claim causal effects from het-

erogeneous sources; rather, it identifies converging patterns, unresolved inequalities, and priorities for future school- and classroom-level primary research.

2. Objectives of the Study

The specific objectives of this review are:

- To examine the policy framework governing digital content-based teaching in Indian government schools, with particular reference to the National Education Policy 2020 and national digital platforms such as DIKSHA and SWAYAM.
- To review secondary data on access to digital devices, internet connectivity, and digital literacy among government school students and teachers.
- To assess teacher readiness, attitudes, and training in relation to ICT-based and digital content-based pedagogy.
- To examine the documented impact of digital content-based teaching on learning outcomes, including evidence from the COVID-19 school closure period.
- To identify the principal challenges reported in the literature and to propose recommendations for strengthening digital content-based teaching practices in government schools.

3. Research Methodology

3.1 Research Design

This study adopts a qualitative, interpretive secondary-data review design. It does not collect primary data from students, teachers, parents, administrators, or schools. Instead, it synthesises published and publicly available evidence on digital content-based

teaching and digital educational communication in Indian government schools. The review is thematic rather than statistical because the included sources differ substantially in design, sample, location, period, and outcome measures; therefore, pooling results through meta-analysis would not be appropriate.

3.2 Scope and Analytical Framework

The review examines five connected domains: (a) policy and digital infrastructure; (b) access, connectivity, and the digital divide; (c) teacher readiness, attitudes, self-efficacy, and professional development; (d) pedagogical communication and content design; and (e) learning continuity and outcomes, including evidence from the COVID-19 disruption. These domains were selected because the effectiveness of digital teaching depends not only on content availability but also on the interaction among technology, teacher facilitation, student participation, and local learning conditions.

3.3 Sources of Secondary Data

Evidence was drawn from four categories: government policy documents and official platform materials; national survey and assessment reports, particularly ASER; peer-reviewed research on ICT integration, teacher preparedness, digital pedagogy, and learning outcomes; and reports from established research and development organisations. Key official and institutional sources included the Ministry of Education, NCERT/CIET, ASER Centre, UNICEF, the Azim Premji Foundation, the Observer Research Foundation, and CEPR.

3.4 Selection Criteria and Procedure

Sources were included when they were relevant to school education in India; addressed government-school contexts, students, teachers, digital learning, or educational communication; and were published by a government body, recognised research organisation, or peer-reviewed journal. Priority was given to sources published from 2020 to 2026, while foundational or uniquely comprehensive sources were retained where necessary. Sources were excluded when they were promotional, unattributed, insufficiently documented, unrelated to school education, or focused exclusively on higher education without clear relevance to government schools. Relevant materials were identified through official institutional websites, report repositories, and academic

publications using combinations of keywords including digital education India, government schools India, DIKSHA, ICT integration, teacher readiness, digital divide, COVID-19 learning loss, and educational communication.

3.5 Data Extraction and Analysis

For each included source, information was recorded on the publication details, source type, geographical context, target population, central focus, principal findings, limitations, and relevance to the five analytical domains. The material was then organised through thematic synthesis. Findings were compared to identify convergence, divergence, and areas where evidence was incomplete. Triangulation was used to distinguish policy intentions from implementation conditions and outcomes; for example, policy claims about inclusion were examined alongside survey evidence on household access and studies of teacher competence and learning loss.

3.6 Methodological Limitations

This review is limited by the quality, scope, and comparability of the underlying sources. Much large-scale evidence, including ASER, is household-based and predominantly rural, and therefore cannot fully represent urban, peri-urban, or classroom-level communication practices. State-specific studies also cannot be generalised automatically to all of India. In addition, digital education policy and platform features change quickly. The findings should consequently be read as a structured synthesis of available evidence, not as direct measurement of conditions in every government school.

4. Review of Literature

4.1 Policy Framework: NEP 2020 and National Digital Platforms

The National Education Policy (NEP) 2020 provides the overarching policy architecture for digital content-based teaching in India. The policy explicitly mandates the integration of technology into curriculum delivery and teacher training, and calls for a national repository of high-quality digital resources on foundational literacy and numeracy to be made available on DIKSHA. NEP 2020 further envisages continuous, technology-enabled professional development for teachers, prescribing a minimum of fifty hours of Continuous Professional Development (CPD) annually for every teacher and school head, delivered partly through blended and online modes.

DIKSHA, developed under the National Digital Education Architecture (NDEAR) by the Ministry of Education, functions as the principal national repository of curriculum-aligned e-content for both students and teachers. The platform supports multiple Indian languages, offers QR-coded 'Energised Textbooks' that link printed NCERT books to videos and interactive material, and provides offline access options for use in low-connectivity areas, including pre-loading of content onto smart classroom boards. It also hosts teacher professional development modules, including the NISHTHA training programme, and provides accessibility features such as text-to-speech and Indian Sign Language video content for learners with disabilities. Alongside DIKSHA, the government has developed a suite of complementary platforms and schemes SWAYAM (offering free massive open online courses with certification), SWAYAM Prabha (a bank of educational DTH television channels), e-Pathshala (a repository of NCERT digital textbooks and resources), PM eVidya (a unified, multi-mode digital education initiative combining television, radio, and online delivery), BharatNet (rural broadband infrastructure), and the Pradhan Mantri Gramin Digital Saksharta Abhiyan (PMGDISHA) for rural digital literacy. A recent review situating DIKSHA and SWAYAM within the NEP 2020 framework concludes that these platforms have made tangible contributions to remote learning, teacher training, and inclusive access, particularly during and after the pandemic, but that infrastructure limitations, socio-economic inequities, and persistent gaps in digital literacy continue to constrain their reach (Sharma, Dixit, & Jaiswal, 2025).

Several state governments have supplemented national platforms with their own initiatives. For instance, Delhi's Department of Education has sought proposals for curriculum-mapped, interactive digital content including 3D simulations for Classes 6 to 12 for over a thousand government schools, envisaging a blended model that combines classroom teaching with digital tools, formative assessment analytics, and teacher facilitation guides. Andhra Pradesh similarly partnered with a private edtech provider to extend technology-based learning to government school students in Classes 4 to 10, with a stated aim of improving access to visual and interactive instructional content. Such state-level initiatives illustrate both the diversity of implementation models across India's federal education system and the reliance of many state governments on public-private partner-

ships to deliver digital content at scale.

4.2 Access and the Digital Divide

A recurring theme across the secondary literature is the persistence of a substantial digital divide, even as smartphone penetration in rural India has risen sharply. According to the ASER 2024 report, household smartphone ownership in rural India increased from roughly 36 per cent in 2018 to about 84 per cent in 2024, and access to a smartphone at home among adolescents aged 14 to 16 is now nearly universal, at around 90 per cent for both boys and girls. However, ownership and access do not translate directly into educational use: the same report found that while over 82 per cent of children in this age group knew how to operate a smartphone, only around 57 per cent had used one for educational purposes in the week preceding the survey, compared with a substantially higher proportion who had used a smartphone for social media. Only about 31 per cent of adolescents reported regular access to a device specifically for learning purposes.

The digital divide identified in the ASER data is not purely infrastructural; it is also gendered. Personal smartphone ownership and digital skill levels among girls consistently lag behind those of boys for instance, roughly 85.5 per cent of boys in the 14–16 age group reported knowing how to use a smartphone compared with around 79.4 per cent of girls and girls were also somewhat less likely than boys to be aware of basic online safety features. Analysts reviewing these patterns note that the gap reflects broader patterns of unequal access to household resources and decision-making around device use, rather than differences in digital aptitude.

Broader assessments of India's digital education ecosystem echo these access-related concerns. Reviews of national digital learning platforms point to uneven content coverage across subjects and regional languages, with subjects such as Home Science and languages such as Urdu and Odia comparatively underserved, alongside continuing gaps in basic digital fluency among segments of the population, thin teacher training in digital pedagogy outside major urban centres, and a lack of interoperability across the many platforms teachers and students are expected to use for lessons, assessment, and record-keeping.

4.3 Teacher Readiness, Attitudes, and Training

Teachers are widely identified in the literature as the pivotal link between the availability of digital content and its effective classroom use. Encouragingly, recent survey-based research suggests generally positive teacher attitudes toward ICT integration. A large-scale study of 1,100 higher secondary teachers in Manipur, drawn from both government and private schools, found statistically significant positive affective, cognitive, and behavioural attitudes toward ICT integration, with these positive attitudes holding across teachers from government schools, teachers with professional degrees, and mid-career teachers specifically (Gangmei, 2026).

At the same time, other studies caution that positive attitudes do not necessarily translate into confident or effective use. Research examining the relationship between teachers' ICT self-efficacy and their perception of available ICT infrastructure in Indian government secondary schools has found that overall self-efficacy spanning technological, pedagogical, and integration-related competence tends to be comparatively low, alongside modest perceptions of the adequacy of school-level ICT infrastructure, suggesting that structural and training-related barriers, rather than attitude alone, constrain digital content-based teaching in practice.

NEP 2020's emphasis on continuous professional development is a direct policy response to this gap. National platforms such as DIKSHA host structured teacher training programmes, including NISHTHA and state-specific Teacher Professional Development (TPD) modules, designed to be self-paced and certified, and commentary from NCERT's Central Institute of Educational Technology frames these efforts as central to preparing what is described as a 'digital teacher' for every classroom. Broader reviews of teacher education reform under NEP 2020 similarly describe an effort to redesign both pre-service (through four-year integrated Bachelor of Education programmes) and in-service training to embed digital fluency, ICT skills, and, increasingly, exposure to emerging tools such as AI and AR/VR alongside traditional pedagogical training.

4.4 The COVID-19 Period: Disruption, Digital Learning, and Learning Loss

The COVID-19 pandemic represents the most extensively documented episode of digital content-based

teaching at scale in Indian government schools, and the secondary literature on this period is correspondingly rich. School closures beginning in March 2020 disrupted the education of an estimated 247 to 320 million students nationally, with several states not fully reopening schools until late 2021 or early 2022 among the longest school closures recorded globally. In response, government and low-fee private schools adopted a range of low-technology and multimodal strategies including television and radio broadcasts, printed worksheets, and phone-based check-ins that researchers characterise as innovative but, on average, involving considerably less instructional time than the live video-based instruction available to higher-fee private schools (Gilbertson, Dey, Deuchar, & Grills, 2021).

International and Indian assessments consistently frame the shift to digital and remote learning during this period as having reinforced pre-existing inequalities rather than neutralising them. UNESCO estimated that nearly 70 per cent of Indian students lacked access to a smartphone or comparable device for online classes at the height of the pandemic, and that a large share of parents could not afford the internet costs associated with remote learning. The World Economic Forum's review similarly concludes that the rapid shift to e-learning surfaced long-standing digital and socio-economic inequalities that pre-dated the pandemic, disproportionately affecting the most vulnerable students and threatening longer-term human capital outcomes.

Empirical studies tracking actual learning outcomes during this period document substantial losses in foundational literacy and numeracy. A large panel study of primary school children in Assam, following approximately 5,000 children across 200 schools between 2018 and 2022, found that children lost the equivalent of roughly nine months of learning in mathematics and eleven months in language during the pandemic, with the largest losses concentrated among children lacking household resources and parental support; the same study found that regular practice, teacher interaction, and technology use were each associated with smaller learning losses, underscoring the potential mitigating role of well-supported digital content-based teaching. A separate large-scale assessment by the Azim Premji Foundation, covering over sixteen thousand primary school children across five states, found that a large ma-

jority of children had lost or 'forgotten' at least one specific foundational ability from the previous academic year, with 92 per cent showing losses in language and 82 per cent in mathematics on average. Related panel research has similarly documented learning losses equivalent to one to two years of schooling among young children after eighteen months of closures, with losses significantly greater among older children and those from lower-resource households.

A study examining the direct effects of pandemic-related school closures on government high school students and teachers in Nellore highlights that, despite the scale of disruption, India's education system implemented measures intended to sustain some continuity of learning, and suggests that documenting these Indian experiences can usefully inform comparative research on digital education practice internationally. Taken together, the COVID-19-era literature suggests that digital content-based teaching served as an important, if imperfect and unevenly distributed, mechanism for learning continuity, whose effectiveness was strongly mediated by prior access to devices, connectivity, and household support.

4.5 Pedagogical Practice and Content Design

Beyond access and infrastructure, several studies point to pedagogical and design-related factors shaping the effectiveness of digital content-based teaching. Reviews of platforms such as DIKSHA highlight design features intended to support active, competency-based learning adaptive assessments, practice question banks that identify specific learning gaps, multilingual and multi-format (video, audio, document, interactive) content, and teacher facilitation guides accompanying digital lessons. Commentary on emerging state-level initiatives, such as Delhi's proposal for curriculum-mapped 3D simulation content, similarly emphasises a shift from passive content consumption toward interactive, simulation-based, and formatively assessed learning experiences intended to be used in blended classroom settings rather than as a standalone substitute for teaching.

At the same time, the literature cautions that the presence of digital content does not by itself guarantee pedagogical quality or appropriate use. Concerns raised include the scattering of quality content across disparate, poorly interoperable platforms, comparatively thin coverage in certain subjects and regional languages, and the risk that content designed centrally may not adequately

reflect local classroom realities or teacher capacity, particularly outside major urban centres.

5. Discussion: Integrating the Evidence

Read together, the reviewed evidence supports several integrated observations about digital content-based teaching in Indian government schools. First, India has built substantial national digital infrastructure DIKSHA, SWAYAM, SWAYAM Prabha, e-Pathshala, and PM eVidya that is explicitly designed to serve government school students and teachers, including in low-connectivity settings, and this infrastructure is underpinned by a clear and ambitious policy mandate in NEP 2020. Second, this infrastructure has not eliminated the underlying digital divide: while device ownership has expanded dramatically, actual educational use of digital devices remains a minority practice among adolescents, and clear gender and socio-economic gradients persist in both access and digital skill.

Third, teachers appear broadly receptive to ICT integration in attitudinal terms, but self-efficacy and infrastructural confidence lag behind attitude, pointing to training and support rather than resistance as the binding constraint on effective digital content-based teaching in many government school contexts. Fourth, the COVID-19 period functions in the literature as something close to a natural experiment: it demonstrates both the value of digital and multimodal content delivery in sustaining some learning continuity, and the severity of learning loss where digital access and household support were absent, reinforcing rather than resolving pre-existing inequalities. Finally, pedagogical design matters as much as access: content that is curriculum-aligned, multilingual, interactive, and accompanied by teacher facilitation guidance appears, on the evidence reviewed, to be more consistently associated with positive engagement than content delivery alone.

These findings suggest that digital content-based teaching in Indian government schools should be understood not as a single, uniform intervention, but as a layered system whose effectiveness depends on the alignment of policy design, infrastructure, teacher capacity, and pedagogical content quality. Interventions that strengthen only one layer for instance, expanding device access without corresponding investment in teacher training, or producing high-quality content without addressing last-mile con-

nectivity are, on the evidence reviewed, unlikely to yield proportionate gains in learning outcomes.

6. Key Challenges Identified in the Literature

- Persistent digital divide: despite rising smartphone ownership, actual use of digital devices for learning remains limited, with clear gender, rural–urban, and socio-economic gradients in access and digital skill.
- Teacher capacity gaps: while attitudes toward ICT are generally positive, self-reported ICT self-efficacy and confidence in school-level infrastructure remain comparatively low among government school teachers in several studies.
- Content fragmentation and interoperability: quality digital content is dispersed across multiple platforms with limited interoperability, complicating cohesive digital teaching, and coverage is uneven across subjects and regional languages.
- Infrastructure and connectivity constraints: rural and remote government schools continue to face gaps in electricity, device availability, and internet connectivity that limit consistent use of digital content.
- Documented learning loss: multiple independent studies conducted during and after COVID-
- 19 school closures document substantial losses in foundational literacy and numeracy, concentrated among the most digitally and economically disadvantaged students, indicating that digital content delivery alone did not fully substitute for in-person instruction. Scalability of successful pilots: small-scale digital education initiatives that show promise in specific districts or states have often proved difficult to scale consistently across India's large and diverse government school system.

7. Recommendations

Based on the synthesis of secondary evidence presented above, the following recommendations are proposed for strengthening digital content-based teaching in government schools:

Prioritise last-mile connectivity and device access in the most digitally disadvantaged districts, with particular attention to closing the documented gender gap in device ownership and digital skill among adolescent girls. Strengthen sustained, practicum-based teacher training in digital pedagogy rather than one-time orientation so that teachers' generally positive attitudes toward

ICT translate into confident classroom practice, in line with NEP 2020's Continuous Professional Development mandate.

Improve interoperability and discoverability across national and state digital platforms, so that teachers are not required to navigate multiple disconnected systems for content, assessment, and administration.

Expand content coverage in underserved subjects and regional languages, building on DIKSHA's existing multilingual and accessibility features.

Combine digital content delivery with structured teacher facilitation and formative assessment, rather than treating digital content as a stand-alone substitute for classroom instruction, in keeping with the blended-learning models being piloted in states such as Delhi.

Institutionalise targeted learning-recovery programmes for students affected by pandemic-era learning loss, informed by diagnostic assessment data of the kind generated by ASER and similar surveys.

Invest in rigorous, government-school-focused primary research including classroom-level and longitudinal studies to complement the largely rural, household-survey-based secondary evidence reviewed here.

Limitations of the Study

This paper is subject to the general limitations of any secondary-data review. It relies on the accuracy, methodology, and reporting choices of the original studies and reports cited, which vary in sample size, geographic coverage, and time period, and which the author was not able to independently verify at the level of raw data. Much of the large-scale survey evidence available in the public domain, notably ASER, is concentrated on rural households and may not fully capture conditions in urban and peri-urban government schools. Because digital education initiatives and platforms in India are evolving rapidly, some of the descriptive detail presented here may be superseded by subsequent policy or platform changes. These limitations point to a clear need for complementary primary research for example, school- or district-level surveys, classroom observation, or teacher interviews that could validate, extend, or qualify the patterns identified in this review.

Conclusion

Digital content-based teaching and digital educational communication have become defining features of policy and practice in India's government school system, supported by national platforms and the mandate of NEP 2020. The secondary evidence reviewed here indicates

progress in access to devices and curriculum-aligned resources, as well as generally positive teacher attitudes toward ICT integration. However, access does not consistently translate into educational participation: teacher self-efficacy, reliable infrastructure, local-language content, interactive communication, and structured feedback remain critical mediators of learning. Digital resources should therefore complement not replace teacher-guided, inclusive, and context-sensitive pedagogy. Continued monitoring and rigorous school- and classroom-level primary research are needed to assess whether digital educational communication is becoming more equitable and effective.

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