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INNOVATION IN EDUCATIONAL TECHNOLOGY

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ABSTRACT

Educational Technology has emerged as a significant enabler in transforming the teaching–learning process in the 21st century. In India, policy support through the National Education Policy 2020, along with digital initiatives such as DIKSHA, SWAYAM, and PM e-Vidya, has opened new avenues for the integration of technology in education. This present research investigates the role, effectiveness, and challenges of Educational Technology in Indian schools as well as higher education institutions.

Based on secondary data from UDISE+ 2025, ASER 2024, NCERT 2026, and relevant literature, the study evaluates EdTech across four key dimensions: access, pedagogy, teacher capacity, and learning outcomes. The findings suggest that while EdTech has expanded access to quality content and improved learner engagement, several structural barriers—such as the digital divide, inadequate infrastructure, language limitations, and insufficient teacher training—continue to restrict its full pedagogical potential.

The study emphasizes that technology should not remain merely a delivery mechanism but must become an integral part of the teaching–learning process. It recommends the adoption of a ‘phygital’ blended model, the development of content in regional languages, and continuous professional development of teachers to align with the vision of equitable and quality education outlined in NEP 2020.

KEYWORDS: Educational Technology, Digital Pedagogy, Blended Learning, NEP 2020, ICT in Education, India

INTRODUCTION

The integration of technology in education is no longer optional but imperative. UNESCO (2023) defines Educational Technology as the systematic application of technological

systemes and resources to enhance education. The COVID-19 pandemic acted as a catalyst, forcing 25 crore learners in India to shift online within weeks.

Post-pandemic, India's EdTech landscape is driven by 3 forces: 1. Policy: NEP 2020 mandates technology integration. 2. Infrastructure: 900M internet users and BharatNet. 3. Demand: Learners seeking flexible, skill-based education.

Despite this, ASER 2024 reports 65% rural households lack stable internet. UDISE+ 2025 shows only 47% government schools have functional ICT labs. This creates a paradox: India has built digital highways but many learners are still off-road.

This paper addresses: What is the current status of EdTech in teaching-education? What impact has it had? And what are the issues to its effective implementation?

LITERATURE REVIEW

Several studies have examined EdTech in India. Access and Equity: Banerjee & Duflo (2021) argue that technology can reduce cost of education delivery but may worsen inequality without targeted intervention. ASER 2024 confirms rural-urban digital gap persists. Pedagogical Impact: Mishra & Koehler's TPACK framework (2006) is widely cited to explain that effective EdTech requires overlap of Technology, Pedagogy and Content Knowledge. APU (2024) found that in 68% classrooms, technology was used only for content projection, not pedagogical transformation.

Teacher Capacity: Goel & Singh (2022) found that one-time training like NISHTHA is insufficient. Teachers need ongoing mentorship to design digital lessons. NCERT (2026) reports only 28% educators can create their own digital content.

Learning Outcomes

A meta-analysis by Muralidharan et al. (2023) shows EdTech enhances education by 0.18 SD when combined with teacher support, but has negligible impact in self-education mode. Policy Context: NEP 2020 and NETF guidelines emphasize blended education and vernacular content, but implementation research is sparse. This paper fills that gap.

OBJECTIVES

To map sources and types of Educational Technology in India

The first objective of this study is to identify and classify the various sources and forms of Educational Technology available in India. Educational Technology is not limited to a single platform or tool but includes a wide range of resources such as government initiatives, private EdTech companies, online learning platforms, and institutional programs. Government

platforms like DIKSHA, SWAYAM, and PM e-Vidya play a crucial role in providing accessible and affordable digital content to learners and teachers. At the same time, private organizations contribute through personalized learning applications, test preparation platforms, and skill-based courses. Higher education institutions and state-level initiatives also add to this ecosystem by offering online degree programs and ICT-enabled classrooms. Mapping these sources helps in understanding the diversity, reach, and scope of Educational Technology in the Indian context. It also highlights how different types of technologies serve different purposes, such as content delivery, teacher training, assessment, and skill development.

To analyze impact on teaching practices and education outcomes:

The second objective is to examine how Educational Technology influences teaching methods and learning outcomes. With the integration of digital tools, teaching practices have undergone significant changes, shifting from traditional lecture-based approaches to more interactive and student-centered methods. Teachers now use multimedia content, online assessments, and digital platforms to enhance classroom instruction. Similarly, students benefit from improved access to learning materials, personalized learning experiences, and engaging activities such as gamification. The study aims to evaluate whether these changes have led to measurable improvements in student performance, understanding, and retention of concepts. It also considers how technology affects classroom efficiency, teacher productivity, and overall educational quality. By analyzing these aspects, the study seeks to understand the real impact of Educational Technology beyond its availability.

To identify structural issues

The third objective focuses on identifying the major structural challenges that hinder the effective implementation of Educational Technology in India. Despite rapid growth in digital initiatives, several barriers continue to limit its success. These include the digital divide between rural and urban areas, lack of reliable internet connectivity, insufficient infrastructure in schools, and limited access to digital devices among students. In addition, language barriers and the lack of content in regional languages restrict the reach of technology-based learning. Another key issue is the inadequate training of teachers, which prevents them from effectively integrating technology into their teaching practices. By identifying these structural problems, the study aims to highlight the gaps that need to be addressed for successful implementation of Educational Technology.

To suggest policy measures aligned with NEP 2020

The final objective of this study is to propose practical policy recommendations that are in line with the vision of the National Education Policy (NEP) 2020. NEP 2020 emphasizes the use of technology to promote equitable, inclusive, and high-quality education across the country. In this context, the study aims to suggest measures such as strengthening digital infrastructure, promoting the use of regional languages in digital content, and encouraging continuous professional development for teachers. It also highlights the importance of adopting a blended or ‘phygital’ approach that combines digital tools with traditional classroom methods. Additionally, the study recommends increased investment in research and innovation to evaluate the effectiveness of Educational Technology. These policy suggestions are intended to support the long-term integration of technology in education while ensuring that it benefits all learners equally.

METHODOLOGY

This is a qualitative secondary data analysis. Data sources: UDISE+ 2025, ASER 2024, NCERT 2026, NEP 2020, and 15 peer-reviewed articles 2020-2026. Thematic analysis was used to identify patterns in issues and impact.

SOURCES AND TYPES OF EDUCATIONAL TECHNOLOGY IN INDIA

Type	Examples	Coverage	Pedagogical Use
Govt Platforms	DIKSHA, SWAYAM, NPTEL, PM eVidya	20 Cr+ users on DIKSHA	Content, Teacher Training
EdTech Companies	Physics Wallah, BYJU'S, upGrad	10.4 Bn USD market 2026	Personalized learning, Test Prep
HEI Initiatives	IIT-M Online BSc, IGNOU, DU SOL	50+ lakh learners	Degree programs, ODL
State Models	Kerala KITE, Delhi Smart Classrooms	Statewide	ICT labs, Content
Global MOOCs	Coursera, edX, Khan Academy	Skill-based	Certification, Upskilling

IMPACT ON TEACHING AND LEARNING

On Teaching

Role Shift: The integration of Educational Technology has significantly transformed the role of teachers from being a “sage on the stage” to a “guide on the side.” Earlier, teachers were

the primary source of knowledge, delivering information directly to students. However, with the availability of digital resources, their role has evolved into facilitators who guide students in the learning process. Teachers now curate, organize, and remix digital content from multiple sources to make learning more effective and engaging. This shift promotes a learner-centered approach where students actively participate rather than passively receive information.

Efficiency: Educational Technology has improved efficiency in managing routine academic tasks. The use of Learning Management Systems (LMS) has reduced the time required for activities such as attendance tracking, assignment submission, and grading. According to NCERT (2026), these systems help reduce such workload by nearly 30 percent. This allows teachers to dedicate more time to lesson planning, interactive teaching, and addressing individual student needs, thereby enhancing the overall teaching process.

Collaboration: Technology has enabled better collaboration among teachers across different regions. Platforms like DIKSHA allow educators from various states to share teaching materials, lesson plans, and innovative practices. This exchange of resources helps in improving teaching quality and creates a strong professional network among educators. As a result, teachers can learn from each other and adopt best practices in their classrooms.

On Learning

Access: Educational Technology has expanded access to quality learning resources. For instance, a learner in Bhagalpur can easily access lectures from prestigious institutions like IIT Bombay through platforms such as NPTEL. This has reduced geographical barriers and provided equal learning opportunities to students irrespective of their location.

Personalization: One of the key advantages of Educational Technology is personalized learning. Artificial Intelligence (AI) tools can identify the weak areas of students and provide customized remedial content based on their performance. This helps learners progress at their own pace and receive targeted support, making learning more effective and meaningful.

Engagement: The use of gamification techniques has made learning more interactive and engaging. Features such as quizzes, rewards, and interactive activities motivate students to participate actively in the learning process. According to APU (2024), gamification has increased concept retention by approximately 22 percent, indicating better understanding and memory of topics among learners.

Outcomes: Educational Technology has also shown a positive impact on overall learning outcomes. Data from UDISE+ (2025) indicates that schools equipped with ICT labs have

recorded around 12 percent higher student attendance. This suggests that technology not only improves learning quality but also encourages students to attend school regularly and stay engaged in their education.

CHALLENGES: THE IMPLEMENTATION GAP

Infrastructure and Digital Divide

ASER 2024: 35% rural vs 70% urban internet. Only 52% schools have internet. Power cuts in Bihar, UP last 4-6 hours daily.

Teacher Digital Pedagogy

Training focuses on tools, not teaching. 40% educators untrained – NCERT 2026. Need for "TPACK" training.

Language and Context

55% content in English – NCERT 2026. NEP 2020 goal of content in 22 languages is <20% achieved.

Equity

SC/ST girls device ownership: 12% – Subramanian 2023. Children with disabilities lack screen readers and sign-language videos.

Assessment and Quality

SWAYAM completion: 12-15%. Online exam integrity remains a challenge.

NEP 2020 AND RECOMMENDATIONS

The National Education Policy (NEP) 2020 provides a comprehensive vision for transforming the Indian education system by integrating technology in a meaningful and inclusive way. It emphasizes the need to ensure equitable access, quality learning, and continuous improvement in teaching practices. To effectively achieve the goals outlined in NEP 2020, the following key recommendations are proposed:

Phygital Hubs

One of the important recommendations is the establishment of “phygital hubs” in cluster schools. These hubs combine digital resources with physical support systems, ensuring that students benefit from both online and offline learning environments. In this model, digital content such as recorded lectures, e-books, and interactive modules is made available, while a physical mentor or facilitator is present to guide students. This approach helps bridge the gap between technology and human interaction, especially in areas where students may lack self-

learning skills or digital literacy. By integrating physical guidance with digital tools, Phygital hubs can make learning more accessible, effective, and inclusive for all students.

Teacher as Creator

Another key recommendation is to encourage teachers to become active creators of digital content rather than just users. Providing financial support or stipends to educators for developing educational videos, lesson plans, and digital materials in local languages can significantly enhance the availability of relevant and context-specific content. This not only empowers teachers but also ensures that learning materials are better aligned with the cultural and linguistic needs of students. When teachers take part in content creation, they can design materials that are more relatable and easier for learners to understand, thereby improving the overall quality of education.

Low-Bandwidth Design

Considering the challenges of internet connectivity in many parts of India, especially rural areas, it is essential to design Educational Technology solutions that require minimal bandwidth. This includes the development of offline applications, distribution of content through SD cards, and the use of widely accessible platforms such as WhatsApp for educational purposes. Such solutions ensure that students can continue learning even in areas with limited or unstable internet access. By focusing on low-bandwidth design, the education system can become more inclusive and ensure that no learner is left behind due to technological constraints.

RESEARCH

The final recommendation highlights the importance of promoting research in the field of Educational Technology. There is a need to fund India-specific studies that evaluate the effectiveness and impact of EdTech initiatives in different contexts. Institutions such as the National Educational Technology Forum (NETF) can play a crucial role in supporting such research. These studies can provide evidence-based insights into what works best in the Indian education system and help policymakers make informed decisions. Strengthening research will ensure that technology integration is not only innovative but also effective and aligned with the actual needs of learners and educators.

CONCLUSION

Educational Technology in India has crossed the "access" stage and entered the "impact" stage. The next decade will determine if it becomes an equalizer or a new divider. The answer lies not in more apps, but in better pedagogy, better educators, and better context. As NEP 2020 states: Technology must serve the goal of human development.

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