

ICT in Education in India: Progress, Policies, and Challenges

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ABSTRACT: Amid rapid digital transformation, information & communications technology (ICT) has emerged as a pivotal element in the development of education in India, that serves as a fundamental pillar in achieving educational equity and improving the quality of learning. Since the 1980s, India has seen successive efforts to integrate technology into education, from computer literacy programs to advanced digital platforms such as **SWAYAM** and **DIKSHA**. National policies, notably the **National Policy on Education 2020** and the **National Mission on Education through ICT (NMEICT)**, have established a comprehensive framework aimed at promoting digital learning and empowering both teachers and students.

The application of ICT in the Indian education system has brought about a tangible shift in teaching and learning methods, from traditional to blended and virtual learning, providing greater access to knowledge resources. However, this journey faces significant challenges, including the digital divide, weak infrastructure, and disparities in technical competencies among teachers and learners. Case studies in states such as Kerala and Karnataka highlight pioneering models of technology integration for more inclusive and effective education.

Recent innovations, including artificial intelligence and adaptive learning, have helped propel the education system toward new horizons. This research emphasizes the need to adopt sustainable policies that ensure digital inclusion, build human capacity, and foster public-private collaboration, making ICT a strategic tool for achieving modern and balanced education in India.

KEYWORDS: ICT, NMEICT, National Policy on Education, Indian education system, Artificial Intelligence

1. INTRODUCTION

Over the past two decades, information and communications technology (ICT) have emerged as a pivotal factor in the radical transformation of education systems around the world, particularly in developing countries seeking to achieve comprehensive knowledge and social development. In the context of India, which has the third largest education system in the world in terms of student numbers¹, ICT tools and applications are strategically key to addressing a range of structural challenges: from expanding student numbers to ensuring quality and equality of learning opportunities.

India is currently at a critical stage in its educational journey, as it is expected to fulfil its national ambition of becoming a 'global knowledge power' (Vishva Guru) by strengthening digital education and its technological skills base². In this context, this study aims to reveal the developments that have taken place in the integration of information and communication technology into the Indian education system, review the policies and national framework related to this integration, analyses the need for and potential impact of these technologies on the learning process, study the challenges that hinder their effective implementation, and explore future prospects.

In this research, we will discuss Historical Background of ICT in Indian Education, National Policies and Frameworks, Implementation of ICT in Indian Education System, Role of ICT in Enhancing Education in India, Case Studies and Indian Experiences, Challenges in ICT Implementation, Recent Developments and Innovations, Recommendations and at the end of this research, we will come to the outcome of this research, while focusing on: How have ICT initiatives in education in India evolved from their inception to the present day? What national policies and frameworks have supported or limited the integration of ICT into the Indian education system, and how effective have they been? How is ICT implemented across different levels of education in India, and to what extent is it used by teachers and students? To what extent does ICT play a role in improving access to and quality of education in the Indian context? What are the main challenges hindering the effective implementation of ICT in education

¹ Varma Subodh, (Jul 3, 2014) *At 315 million, India has the most students in world*, The Times of India, New Delhi. Retrieved from: https://timesofindia.indiatimes.com/india/at-315-million-india-has-the-most-students-in-world/articleshow/37669667.cms?utm_source= (Last visited on: 16/10/2025).

² Singh, R. (30/ August/2022). *India will occupy position of Vishva Guru by 2047: Rajnath Singh*. The Hindu. Retrieved from <https://www.thehindu.com/news/national/india-will-occupy-position-of-vishwa-guru-by-2047-rajnath/article65831548.ece> (Last visited on: 16/10/2025).

ICT in Education in India: Progress, Policies, and Challenges

in India? What are the future trends and potential innovations in the integration of ICT in Indian education, and what are the possible recommendations to maximize its effectiveness.

2. NEED TO INTEGRATE ICT INTO THE INDIAN EDUCATION

Before discussing anything about ICT in Indian Education System, we had better know the needs to integrate ICT into the Indian education, and it has several factors:

First: The significant expansion in the number of learners (both in school and higher education) is putting pressure on traditional classroom structures and teachers.¹

Second: There are significant gaps in access to quality education, especially in rural areas and marginalized communities.²

Third: The global shift towards a knowledge economy and lifelong learning, which makes ICT not an option but a necessity for preparing learners for the 21st century; and finally, a crisis such as the COVID-19 pandemic, which has exposed the fragility of traditional methods of education and given a strong impetus to digital education.³ From this perspective, ICT plays a dual role:

(a) as an enabling tool for accessing and interacting with educational content (including distance learning, blended learning, and open platforms).

(b) as a catalyst for improving the quality of learning — through interactive learning, teacher support, digital assessments, and other modern practices. It can be said that the development of Indian education through ICT is not only an improvement in means, but a strategic change in learning, teaching, and the skills required.

3. HISTORICAL BACKGROUND OF ICT IN INDIAN EDUCATION

It is a fact that Rome was not built in a day, such is the ICT in Indian Education System. However, India has started this option years ago, but it took many times to reach this level as per today. ICT in Indian Education System has passed through the following processes:

A. Early Beginnings (Pre-Independence – 1947)

India began using information and communication technology in education in the early 20th century. In June 1923, Radio Club Mumbai launched India's first educational radio broadcast⁴. In 1937, All India Radio began broadcasting educational programs for children³. The British Broadcasting Corporation (BBC) also provided educational and cultural programs in India via radio in the 1930s⁵.

In the 1960s, India began to explore the use of television as an educational tool. In 1961, UNESCO and the Ford Foundation launched a pilot project to use television in secondary education in Delhi.⁶

B. Post-Independence Period (1947–1970)

After independence, India began developing educational programs using information technology. In 1972, India began producing educational programs via radio, which helped reach remote areas.⁷ In 1975, India launched the Satellite Instructional Television Experiment (SITE) in collaboration with NASA, which aimed to use satellites to transmit educational programs to rural areas.⁸

¹ Datta, S. and Kingdon, G.G. 2021. *Class Size and Learning: Has India Spent Too Much on Reducing Class Size?* RISE Working Paper Series: 21/059. Retrieved from: https://doi.org/10.35489/BSG-RISE-WP_2021/059 (Last visited on 16/10/2025).

² Choudhury, P. K. (2023). *Regional And Socioeconomic Inequalities in Access to Pre-School Education in India*, National Library of Medicine. Retrieved from: <https://pmc.ncbi.nlm.nih.gov/articles/PMC10123015/>. (Last visited on: 16/10/2025).

³ Goswami, M. P., Thanvi, J., & Padhi, S. R. (2021). *Impact of Online Learning in India: A Survey of University Students During the COVID19 Crisis*, Asian Journal for Public Opinion Research, 9(4), 331–351. Retrieved from: <https://www.ajpor.org/article/27445-impact-of-onlinelearning-in-india-a-survey-of-university-> (Late Visited on 17/10/2025).

⁴ Government of India, Press Information Bureau, (22 JUL 2024), *National Broadcasting Day - 2024, Celebrating India's Public Broadcasting Legacy*. Retrieved from: <https://www.pib.gov.in/PressNoteDetails.aspx?NoteId=151941&ModuleId=3> (Last visited on 17/10/2025). ³ Dr. Ashok Kumar, *Promotion of Education Through All India Radio*, International Journal of Information Movement, Vol. 9 Issue II (June 2024).

⁵ ALASDAIR PINKERTON, *Radio and the Raj: broadcasting in British India (1920–1940)*, Journal of the Royal Asiatic Society, Volume 18, Issue 2, April 2008, pp.

⁶ R V Vyas, *Educational Television in India*, Turkish Online Journal of Distance Education-TOJDE October 2002 ISSN 1302-6488 Volume:3 Issue Number:4.

⁷ Professor R V VYAS, *Educational Radio in India*, Turkish Online Journal of Distance Education-TOJDE July 2002 ISSN 1302-6488 Volume: 3, Issue Number: 3.

⁸ Agrawal, B. N., & Malhotra, S. K. (1976). *Satellite Instructional Television Experiment (SITE): An overview. Proceedings of the IEEE*. Retrieved from: [http://kuvempu.ac.in/eng/studymetrial/Login/Admin/study_material/283023-04-2020Satellite%20Instructional%20Television%20Experiment%20\(SITE%20Experiment\).pdf](http://kuvempu.ac.in/eng/studymetrial/Login/Admin/study_material/283023-04-2020Satellite%20Instructional%20Television%20Experiment%20(SITE%20Experiment).pdf). (Last visited on 17/10/2025).

ICT in Education in India: Progress, Policies, and Challenges

C. Expansion of Information Technology (1980–2000)

In the 1980s, India began introducing computers into schools.¹ In 1984, some schools began using computers as a teaching tool. In the same year, the Indian government launched the Computer Literacy and Studies in Schools (CLASS) program, which aimed to teach students and teachers the basics of computer use.²

D. National Initiatives (2000–2010)

In 2004, the Indian government launched the ICT@Schools program, which aimed to introduce information technology into public and private schools.³ In 2009, the Indian government launched the National Mission on Education through ICT (NMEICT), which aimed to use ICT to expand access to higher education.

In 2010, the Indian government launched the Open Educational Resources (OER) program, which aimed to provide open educational resources online.⁴

E. The Digital Age (2010–present)

In the last decade, India has witnessed a major transformation in the use of information and communication technology in education. Several digital initiatives have been launched, such as SWAYAM (an open online learning platform), e-Yantra (an initiative in the field of robotics), Spoken Tutorial (a platform for teaching programming), and the National Digital Library of India.

In 2020, the Indian government launched the National Education Policy (NEP), which emphasized the importance of using ICT in education.

4. INDIAN NATIONAL POLICIES AND FRAMEWORKS

India's National Policy Framework for Education serves as the cornerstone for guiding the development of education, particularly in the area of integrating information and communication technology (ICT) into the education system. Since the 1980s, the Indian government has recognized the critical role of technology in achieving the goals of equity and equality in education. Clear technological components were included in the National Education Policy of 1986 and 1992, which emphasized the use of multimedia and telecommunications to support education. At the turn of the 21st century, this interest evolved into the 2012 ICT in School Education Policy, which aimed to mainstream digital education and provide schools with the necessary infrastructure.

The National Education Policy 2020 (NEP 2020) emphasized a fundamental shift towards digital and blended learning, making ICT a key pillar in building an integrated knowledge economy. In this research, we will discuss some of the important Indian National Policies and framework, and they are as follows:

★ National Policy on Education (1986, 1992)

The Indian government first issued the National Policy on Education in 1986, which was later amended in 1992 to meet the changing needs of the Indian education system. This policy aimed to achieve a comprehensive, highquality education system that could meet the social, economic and technological challenges facing the country. The policy focused on expanding educational opportunities for all citizens, improving its quality, and ensuring educational equity across different social classes and geographical regions.⁵

The policy also emphasized developing teachers' capacity to use these educational media effectively. Initiatives included training programs for teachers to familiarize them with technology-based teaching methods, as well as ways of employing multimedia in explaining subject matter. In addition, the policy focused on developing initial digital educational content, such as educational films and interactive programs on compact discs, to provide students with diverse educational resources. Universities and research centers were also encouraged to collaborate with schools to provide modern educational materials and enhance the skills of students and teachers in using technological media. This formed the basis for what later became an integrated national approach to integrating information and communication technology into education.⁶

★ Information and Communication Technology Policy in School Education (2012)

In 2012, the Indian government issued a national policy on information and communication technology in school education, with the aim of enhancing the quality of education and expanding access to it through the integration of digital technologies into the educational process. The policy aims to create a modern learning environment that leverages ICT to enhance learning and teaching and facilitate access to educational resources for all students in India, both in urban and rural areas.⁷

¹ DataArt IT Museum, *Educational program in India*. Retrieved from: <https://museum.dataart.com/short-stories/educational-program-inindia>. (Last visited on 17/10/2025).

² Ministry of Education, India, *Information and Communication Technology @ Schools*. Retrieved from: https://www.education.gov.in/sites/upload_files/mhrd/files/upload_document/ICTold%20scheme.pdf. (Last Visited on 17/10/2025).

³ Ministry of Education, India, *ICT in School Education*. Retrieved from: <https://www.education.gov.in/ICT/#>. (Last Visited on 17/10/2025).

⁴ Raysh Thomas, *Use of Open Educational Resources: Indian Scenario*. International Journal of Library & Information Science, 6(5), 2017, pp. 17–26. Retrieved from: https://iaeme.com/MasterAdmin/Journal_uploads/IJLIS/VOLUME_6_ISSUE_5/IJLIS_06_05_003.pdf. (Last visited on 18/10/2025).

⁵ Ministry of Human Resource Development. (1992). National Policy on Education (1986, Revised 1992). Government of India. Retrieved from https://www.education.gov.in/sites/upload_files/mhrd/files/upload_document/NPE86-mod92.pdf (Last visited on 18/10/2025).

⁶ NCERT, *Use of Educational Technology in Indian Schools*, New Delhi: National Council of Educational Research and Training, 1992.

⁷ Ministry of Human Resource Development, (23 March, 2012), *National Policy on Information and Communication Technology in School Education*, Government of India, Retrieved from

ICT in Education in India: Progress, Policies, and Challenges

The policy focuses on enhancing the digital capabilities of both students and teachers, emphasizing the importance of developing basic digital skills among students and preparing teachers to use digital learning tools effectively. These tools include computers, educational software, multimedia digital content, and distance learning platforms, with the aim of improving classroom interaction and stimulating critical and creative thinking among students. The policy also aims to integrate digital learning with traditional school curricula to provide a comprehensive and integrated educational experience.¹ Along with all this, the policy focuses on evaluating the effectiveness of ICT use in schools by monitoring implementation, collecting data on educational performance, and providing technical support to teachers and administrators. It also encourages the promotion of partnerships with the private sector and non-governmental organizations to provide technological resources and improve the quality of education.²

▪ National Education Policy 2020 and Focus on Information and Communication Technology

The Indian government released the National Education Policy (NEP) in 2020, the first comprehensive review of education policies in more than three decades, which aims to modernize India's education system in line with the requirements of the 21st century. The policy focuses on enhancing the quality of education, expanding access to it, and achieving inclusiveness, while emphasizing the critical role of information and communication technology (ICT) in all stages of the educational process. NEP 2020 aims to empower students, teachers, and educational institutions with modern digital skills and transform India into a digital knowledge society.³ The policy emphasizes the integration of ICT in all aspects of education, from primary to higher education. This includes the use of digital learning tools, multimedia resources, e-learning platforms, and digital libraries to promote universal access to knowledge. The policy also calls for updating curricula to include basic IT skills and project-based learning, thereby promoting critical thinking, creativity, and problem-solving among students. These updates aim to prepare young people to face the challenges of the global digital economy (Narayan, 2021).⁴

NEP 2020 also focuses on building the digital capabilities of teachers, by providing advanced training programs that enable them to use technological tools efficiently in the classroom, manage digital resources, and assess students using digital learning technologies. Key initiatives supporting the implementation of the policy include platforms such as SWAYAM, which provides open online education; DIKSHA, which offers digital educational content and training for teachers; and e-Pathshala, which provides digital educational resources for students and teachers. These initiatives contribute to enhancing the quality of education and providing equal learning opportunities to students in both urban and rural areas.⁵

5. MAJOR ICT INITIATIVES IN INDIA

India's National Policy Framework for Education serves as the cornerstone for guiding the development of education, particularly in the area of integrating information and communication technology (ICT) into the education system. Since the 1980s, the Indian government has recognized the critical role of technology in achieving the goals of equity and equality in education. Clear technological components were included in the national education policies of 1986 and 1992, which emphasized the use of multimedia and telecommunications to support education. To fulfill all these, the Indian Government started some major Initiatives, some of them are as follows:

▪ Digital India Program

The Digital India Program was launched on 1 July 2015 under the leadership of Prime Minister Narendra Modi, with the aim of transforming India into a fully digital society and an advanced knowledge-based economy using information and communication technology. The program aims to enable citizens to access government services easily and transparently, improve the quality of education and public services, and promote digital economic growth in the country⁶. The program is an essential part of India's strategy for comprehensive digital transformation and relies on developing digital infrastructure, increasing digital awareness among citizens, and promoting e-government.

The Digital India program focuses on three key pillars to achieve its objectives. The first pillar relates to providing digital infrastructure for every citizen, with the creation of fiber optic networks (Bharat Net) to cover rural and remote areas, providing

https://www.education.gov.in/sites/upload_files/mhrd/files/upload_document/revised_policy%20document%20ofICT.pdf (Last visited on 18/10/2025).

¹ UNESCO, (March 2012). *National policy on information and communication technology (ICT) in school education*. Retrieved from <https://planipolis.iiep.unesco.org/en/2012/national-policy-information-and-communication-technology-ict-school-education-6463> (Last visited on 18/10/2025).

² Ministry of Education, Government of India. *NATIONAL MISSION ON EDUCATION THROUGH INFORMATION & COMMUNICATION TECHNOLOGY [ICT]* Retrieved from: https://nmeict.ac.in/?page_id=657. (Last visited on 19/10/2025)

³ Ministry of Education, 2020, National Education Policy 2020, Ministry of Human Resource and Development, Government of India, Retrieved from https://www.education.gov.in/sites/upload_files/mhrd/files/NEP_Final_English_0.pdf (Last visited on 19/10/2025).

⁴ Sanjay Kumar, *The Role Of Technology in NEP 2020: Opportunities and Challenges*, International Journal of Advanced Academic Studies, Int J Adv Acad Stud 2025;7(4):106-109. DOI: [10.33545/27068919.2025.v7.i4b.1433](https://doi.org/10.33545/27068919.2025.v7.i4b.1433) (Last visited on 19/10/2025).

⁵ Rashmi Ramesh Pulate, Dr. Jayshree R. Dighe, Manoj Maruti Dongare, *Transforming Learning in India: NEP 2020 and the Vision of Education 5.0*, International Journal of Economics, Business, Accounting, Agriculture and Management towards Paradigm Shift in Research, Volume: 2 Issue: 2, April-2025.

⁶ Government of India, 2015, *Digital India: Program to Transform India into A Digitally Empowered Society And Knowledge Economy*. Retrieved from <https://www.digitalindia.gov.in/about-us/>. (Last visited on 19/10/2025).

ICT in Education in India: Progress, Policies, and Challenges

high-speed internet, and establishing government data centers that ensure secure storage and instant access to information. Digital platforms have also been developed to facilitate interaction between the government and citizens, such as electronic payment platforms and online government services.

The second pillar is e-government and on-demand services, which aim to transform traditional services into unified digital platforms that allow citizens to submit their requests, follow up on their transactions, and access services easily and conveniently. This includes administrative, educational, health, and financial services, reducing the need for paperwork and increasing transparency and efficiency. Public information and government services are also made openly available online to promote community and digital participation.

The third pillar relates to digitally empowering citizens by enhancing their digital skills and providing access to online educational and training tools. This includes programs such as PMGDISHA, which aims to raise the level of digital literacy among citizens, especially in rural areas, and enable them to use digital services effectively. The program also includes platforms such as Digi Locker, which provides citizens with a means to easily store and access official digital documents, and the Aadhaar system, which represents the unified digital identity of every citizen, contributing to the delivery of accurate and efficient government services.¹

• National Mission for Education through Information and Communication Technology (NMEICT)

The National Mission for Education through Information and Communication Technology (NMEICT) is a pioneering government initiative in India, launched with the aim of integrating digital technology into the higher education sector. This initiative aims to enhance access to quality education for all students, including those living in remote or marginalized areas. NMEICT was established as part of the government's National Education Development Plan in India and is based on the idea that technology can be an effective means of expanding the reach and quality of learning nationwide.²

The mission focuses on three main pillars. The first is digital infrastructure, which includes the development of a national digital knowledge network connecting all universities and educational institutions in India. This pillar aims to provide access to high-speed internet, digital libraries, and e-learning platforms, thus improving students' and teachers' access to modern educational resources.³ The second axis concerns the development of open digital educational content, where multimedia educational resources such as video lectures, e-books, and interactive learning tools are prepared across various disciplines. These resources are designed to support self-learning and distance learning and provide continuing education opportunities for both students and teachers. The third axis focuses on capacity building and training, with NMEICT offering advanced training programs for teachers and faculty members at universities and colleges. This aspect aims to enhance skills in the use of information and communication technology in education and the effective management of the educational process. Additionally, the initiative supports the creation of e-learning platforms such as SWAYAM and e-PG Pathshala, which provide free and open online academic content, contributing to the provision of world-class higher education to all students regardless of their geographical location.⁴

★ SWAYAM Platform

The SWAYAM platform is one of India's leading digital initiatives, launched by the Indian government with the aim of providing open, high-quality education to all citizens, with a focus on achieving universal access and equality in educational opportunities. The platform was established in 2017 within the framework of the National Policy on Education 2020 and digital initiatives such as the Digital India Program and the National Mission on Education through ICT (NMEICT). SWAYAM aims to bridge the educational gaps between urban and rural areas and between different categories of students by providing reliable and free digital educational resources to all citizens.⁵

The SWAYAM platform is based on the Massive Open Online Courses (MOOCs) model, offering courses covering various academic levels, from school education to university education to continuing education and professional development programs. The educational content is produced by leading universities and educational institutions in India and includes video lectures, digital study materials, assessment tests, and interactive platforms to support self-learning. The platform allows students to track their academic progress and achieve continuous assessment through advanced digital tools, enhancing learning efficiency and enabling a comprehensive and integrated learning experience.³

¹ Abhishek Beriya, August 2021, *Digital India Program: Going Full Circle*, Center for Development Program, Columbia University. Retrieved from: https://csd.columbia.edu/sites/csd.columbia.edu/files/content/docs/ICT%20India/Papers/ICT_India_Working_Paper_56.pdf . (Last visited on 19/10/2025).

² Ministry of Human Resource Development, 26 January 2023, *National Mission on Education through ICT (NMEICT)*, Government of India. Retrieved from <https://www.education.gov.in/en/technology-enabled-learning-0> . (Last visited on 19/10/2025).

³ PAWAN AGARWAL, *Higher Education In India: The Need for Change*, Indian Council for Research on International Economic Relations, New Delhi, JUNE 2006.

⁴ Bhavna Dubey and Dr. Sita Devi, *Use of ICT in Higher Education in India*, International journal of economic perspectives, ISSN: 1307-1637, Vol. 16 No. 5 (2022-05-12).

⁵ Viji, 10/04/2025, *SWAYAM: Study Webs of Active-Learning for Young Aspiring Minds*, Government of India, retrieved from <https://education.vikaspedia.in/viewcontent/education/interactive-resources/swayam-learning-portal?lgn=en> (Last visited on 20/10/2025). ³ Dr. Nettem Venkata Narayana, Mar – 2020, *The Role of SWAYAM in Higher Education*, INTERNATIONAL JOURNAL OF RESEARCH CULTURE SOCIETY, Volume - 4, Issue - 3.

ICT in Education in India: Progress, Policies, and Challenges

SWAYAM also contributes to promoting educational equality, as the platform provides multilingual content to meet the needs of students from different states and regions, reducing language barriers and helping students learn in their mother tongue. The platform also supports access to education for marginalized groups and students in remote areas, who can benefit from digital courses without the need for travel or high costs. This initiative is an important tool for achieving educational inclusivity and reducing educational gaps in India. In addition, SWAYAM promotes self-learning skills among students, encouraging them to pursue courses at their own pace and according to their own abilities, and allowing them to communicate with teachers and peers through digital forums and interactive platforms. This model of open learning helps develop critical thinking, creativity, and problem-solving skills, preparing students for the demands of the modern job market and the cognitive challenges of the digital economy.¹

★ DIKSHA Platform

The DIKSHA (Digital Infrastructure for Knowledge Sharing) platform is one of India's leading digital initiatives, launched by the government to support teachers and enhance their capabilities by providing comprehensive digital learning resources, training courses and tools for skills development. The platform was established within the framework of national policies to promote digital education, including the National Policy on Education 2020 and the National Mission on Education through ICT (NMEICT), with the aim of improving the quality of education in all Indian schools, including public and private schools, and facilitating equitable access to modern educational resources.²

DIKSHA focuses on empowering teachers by providing diverse digital content that includes curricula, interactive lessons, educational videos, and self-assessment tools. The platform also offers specialized training courses to develop teachers' skills in using educational technology and applying it in the classroom. This digital support enables teachers to improve their teaching methods, enhance interaction with students, and achieve active and sustainable learning. Along with this, DIKSHA also enables the creation of an interactive learning environment, where teachers can share resources, expertise and learning experiences with their colleagues across the country. The platform provides access to digital content in multiple languages, contributing to educational inclusivity and empowering teachers to deliver effective education in various

rural and urban areas. The platform caters to the needs of both new and experienced teachers by providing tiered training content that corresponds to their different levels and practical experience.³

In addition to supporting teachers, DIKSHA contributes to improving the quality of education for students, as teachers can use the digital resources available on the platform to enhance classroom interaction and deliver rich, multimedia educational content. The platform also provides tools for assessing student performance and tracking their academic progress, making it easier for teachers to identify students' strengths and weaknesses and take appropriate educational measures to improve learning outcomes. These tools contribute to the development of a continuous learning process and the achievement of personalized learning for each student.²

▪ e-Pathshala

The e-Pathshala initiative is one of India's leading digital initiatives, launched by the government in collaboration with the National Council of Educational Research and Training (NCERT), with the aim of providing comprehensive digital educational content to both students and teachers. This initiative is designed to ensure universal access to educational resources and promote equal educational opportunities for all students in different regions, whether urban or rural. e-Pathshala is part of the government's efforts to apply information and communication technology (ICT) in education, in line with national education policies such as the National Education Policy 2020 and the National Mission on Education through ICT (NMEICT).⁴

e-Pathshala focuses on providing diverse digital educational content covering all subjects for students from primary to secondary school, as well as additional content for teachers to develop their pedagogical skills and use of technology in the educational process. The content includes digital books, educational videos, interactive resources, and e-lectures, allowing students to learn at their own pace and according to their abilities. The platform also provides tools for assessing students' academic performance, helping teachers track their progress, identify their strengths and weaknesses, and take appropriate educational measures to enhance individual and group learning. Along with this, e-Pathshala contributes to promoting educational equality by providing content in multiple languages, including the official languages of different states, to cater to the needs of students across India. The platform also provides access to educational resources anytime, anywhere, making it easier for students and teachers to use digital content without

¹ Santu Biswas, *MOOC: Challenges & Prospects in Indian Higher Education*, October 2022, Journal of Information and Computational Science, ISSN: 1548-7741, Volume 10, Issue 2 - 2020.

² Ministry of Education, 2024, *DIKSHA: Digital Infrastructure for Knowledge Sharing*, Government of India. Retrieved from <https://diksha.gov.in/about/>. (Last visited on 20/10/2025).

³ Anindita Banerjee, July 2025, *Empowering Educators, Bridging Divides: Evaluating Diksha and Swayam for Digital Teacher Training and Economic Inclusion in India*, INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS, Volume 13, Issue No. 7. ² Sanjay Kumar, 2025, *The Role of Technology in NEP 2020: Opportunities and Challenges*, International Journal of Advanced Academic Studies, Vol. 7, Issue 4, Part B.

⁴ Ministry of Education, 2023, *e-Pathshala: National Digital Repository for School Education*, Government of India. Retrieved from <https://epathshala.nic.in/pages.php?id=about-us&ln=en>. (Last visited on 20/10/2025).

ICT in Education in India: Progress, Policies, and Challenges

having to travel or rely solely on paper books. This open access promotes self-learning and gives students the opportunity to improve their academic skills and keep up with modern curricula.¹

Apart from all the above major initiatives, in the same context there are some other ones that play a vital role in contributing to ICT in Indian Education System. Such as:

- **The BRIHASPATI:** The BRIHASPATI system, developed by the Indian Institute of Technology in Kanpur as an open-source e-learning management system, enabled professors to upload lectures and notes online and made them easily accessible to students. This project represented India's first attempt to build a local digital learning platform that enhanced the independence of universities in managing their academic content.²
 - **EDUSAT:** In 2004, the Indian Space Research Organization (ISRO) launched the EDUSAT satellite, the first satellite dedicated to educational purposes, with the aim of supporting education in rural and remote areas through satellite broadcasting of academic content and real-time interaction between learners and teachers, which marked a qualitative shift in the concept of distance education in India.³
 - **SAKSHAT:** The SAKSHAT portal was launched in 2006 by the Ministry of Human Resource Development (MHRD) as a comprehensive platform linking all educational institutions such as NCERT, UGC, IITs and IGNOU, providing free digital resources to students, teachers and researchers in various disciplines. This portal has contributed to establishing the concept of 'open education for all'.⁴
 - **e-SIKSHAK:** In the context of promoting vocational and technical education, the Centre for Development of Advanced Computing (C-DAC) launched the e-SIKSHAK platform to provide an interactive e-learning environment in several local languages, thereby promoting the inclusiveness of digital education among communities speaking regional languages.⁵
 - **e-Yantra Project:** The e-Yantra project, funded by the Ministry of Education and implemented at the Indian Institute of Technology in Bombay, is one of the most prominent initiatives focusing on practical training in the fields of robotics and embedded systems. The project aims to build a new generation of creative engineers capable of providing technical solutions to real-world problems through project-based learning.⁶
 - **e-KALPA (D'SOURCE):** Similarly, the e-KALPA (D'SOURCE) project, supported by the Ministry of Education, aims to create a digital environment for online design education. The project provides open digital educational resources in the fields of industrial and artistic design, which has helped to democratise creative education in India.⁷
 - **Virtual Learning Environment (VLE):** The University of Delhi's Virtual Learning Environment (VLE) was established in 2012 within the Centre for Lifelong Learning to provide online university courses and interactive digital educational resources. It has become a model for the development of open online university education in the country.⁸
- Together, these initiatives reflect India's vision of building an integrated digital education system that keeps pace with global technological developments, promotes equitable access to high-quality education, and supports the transition to a 'digital India' in the field of knowledge and education.

6. APPLICATION OF INFORMATION AND COMMUNICATION TECHNOLOGY IN THE INDIAN EDUCATION SYSTEM

Over the past two decades, India has witnessed a gradual shift towards integrating information and communication technology (ICT) into the education system at all levels, from school education to higher education. This shift aims to improve the quality of education, expand access to it, and enable students and teachers to use modern digital technologies to enhance learning and teaching. The application of ICT in India includes a range of government initiatives and national programs that support digital integration in educational curricula, the development of digital infrastructure, and the enhancement of digital learning skills among both students and teachers. Some of these applications are as follows:

✦ Integration in School Education:

At the school education level, the National Council of Educational Research and Training (NCERT) and the Central Board of Secondary Education (CBSE) have played a pivotal role in integrating ICT into the educational process. The NCERT has launched initiatives to create digital content for textbooks, including multimedia such as educational videos, illustrations, and interactive simulations that help students understand academic concepts in innovative ways. In addition, CBSE has developed technology-

¹ Ministry of Education India, 20/10/2025, *ePathshala : Empowering Education Digitally*, Government of India, retrieved from <https://www.ux4g.gov.in/case-studies/ux4g-ePathshala.php>, (Last visited on 20/10/2025).

² IIT Kanpur, retrieved from official account, 2022, <https://home.iitk.ac.in/~yensingh/tool/brihaspati.shtml> (Last visited on 21/10/2025).

³ EDUSAT, retrieved from official account, 2023, <https://www.isro.gov.in/EDUSAT.html>, (Last visited on 21/10/2025).

⁴ Ministry of Higher Education, 19 April 2016, <https://www.education.gov.in/en/technology-enabled-learning-1>, Government of India, (Last visited on 21/10/2025).

⁵ Centre for Development of Advanced Computing, retrieved from official account, 2025, <https://cdac.in/index.aspx?id=about> (Last visited on 21/10/2025).

⁶ e-Yantra Resource Development Center, retrieved from official account, 2015, <https://content.e-yantra.org/content> (Last visited on 21/10/2025).

⁷ D'source, retrieved from official account, <https://www.dsourc.in/about/us>, (Last visited on 21/10/2025)

⁸ University of Delhi, retrieved from official account, October 202, <https://www.du.ac.in/index.php?page=virtual-learning>, (Last visited on 21/10/2025).

ICT in Education in India: Progress, Policies, and Challenges

based educational programs to promote selflearning among students and encourage them to use digital tools to apply theoretical knowledge to solve practical problems.¹

✦ ICT in Higher Education

In the field of higher education, Indian universities and educational institutions have relied on ICT to expand the scope of education and improve its quality. The University Grants Commission (UGC) and the Department of Education Technology for open universities such as the Indian Open University (IGNOU) and the All-India Council for Technical Education (AICTE) play a key role in this transformation. The UGC has launched programs to support digital learning in universities through the development of online courses, integrated learning platforms, and e-learning management tools.²

IGNOU has also contributed to the provision of distance learning programs using ICT technologies, enabling students in remote areas or with work commitments to pursue their university education without having to be physically present on campus. These programs include digital resources such as recorded lectures, interactive course materials, and digital forums for communication between students and professors, which enhance academic interaction and enable self-directed and continuous learning.³

✦ Teacher Training and Digital Teaching Methods

Teacher training is one of the most important elements of ICT implementation in Indian education, as the digital competence of teachers is essential to ensure the success of any digital education initiative. Therefore, the government has launched multiple training programs to enhance teachers' skills in using technology. These platforms provide progressive training content, including familiarization with educational software, interactive lesson design, use of multimedia in the classroom, and digital student assessment. This training enables teachers to develop traditional teaching methods into innovative technology-based teaching methods, which motivates students to engage in active and sustainable learning.⁴

In addition, computer labs have been developed in schools and universities, and digital devices, internet networks, and modern educational software have been provided to support interactive learning. Simulation-based learning, virtual reality, and artificial intelligence technologies are also being integrated into some higher education programs to improve the educational experience and develop students' practical and technical skills.⁵

It can be said that the application of ICT in Indian education represents a quantum leap towards a more inclusive and modern education system that enhances the quality of education, expands access to educational resources, and enables students and teachers to take full advantage of digital technology in the educational process. As the government continues to develop digital infrastructure, train teachers, and expand learning platforms, the effectiveness of ICT integration in education is expected to increase in the near future, contributing to the building of a strong digital knowledge society in India.

7. RECENT DEVELOPMENTS AND INNOVATIONS IN INDIA IN THE FIELD OF INFORMATION AND COMMUNICATION TECHNOLOGY IN EDUCATION

In recent years, India has witnessed a remarkable boom in the field of information and communication technology (ICT) in education, with the emergence of recent innovations that reflect the profound digital transformation in the education system. These developments have contributed to improving the quality of education, increasing access to educational resources, and enhancing interaction between teachers and students. They have also provided innovative solutions to traditional challenges such as the digital divide and infrastructure deficiencies in some areas. Some the most important innovations in India are as follows:

✦ EdTech startups and government collaboration

EdTech startups in India have contributed to radical changes in the way education is delivered. These companies are developing innovative digital learning platforms that provide interactive content and online courses that meet the needs of both students and teachers. One of the most prominent of these companies is BYJU'S,⁶ which offers interactive learning experience based on explanatory videos and digital simulations, as well as continuous assessment of student progress. The Unacademy platform also offers live online lessons by subject matter experts, contributing to higher academic achievement.⁷

The Indian government has supported these initiatives through public-private partnerships, integrating these platforms into national initiatives to expand access to digital resources for all students and teachers, including marginalized groups and students in rural areas. This collaboration allows for the utilization of technical innovation from start-ups, while ensuring that it is aligned with national education policies and the goals of inclusivity and continuous learning.

¹ NCERT, 2018, *Use of Educational Technology in Indian Schools*, New Delhi: National Council of Educational Research and Training.

² Pawan Agarwal, *HIGHER EDUCATION IN INDIA, The Need for Change*, INDIAN COUNCIL FOR RESEARCH ON INTERNATIONAL ECONOMIC RELATIONS, June 2006.

³ IGNOU, retrieved from official account, <https://www.ignou.ac.in/pages/20>, (Last visited on 21/10/2025).

⁴ Same as no.2.

⁵ Sanjay Kumar, *The role of technology in NEP 2020: Opportunities and challenges*, International Journal of Advanced Academic Studies, 2025, Vol. 7, Issue 4, Part B.

⁶ BYJU'S, retrieved from official account, <https://byjus.com/#testimonial-cards>, (Last visited on 21/10/2025).

⁷ Unacademy, retrieved from official account, <https://unacademy.com/about> (Last visited on 21/10/2025).

ICT in Education in India: Progress, Policies, and Challenges

✦ Artificial intelligence, virtual reality and adaptive learning tools

Artificial intelligence (AI), virtual reality (VR), and adaptive learning tools are among the most notable recent innovations in Indian education. AI has been implemented in some educational platforms to deliver educational content tailored to each student's ability level, learning speed, and specific needs. For example, adaptive learning systems analyze student performance and provide individualized learning suggestions to improve their skills, increasing the effectiveness of learning and enhancing interaction within virtual classrooms.

Virtual reality, on the other hand, is used to provide an interactive learning environment that enables students to experience complex concepts in a tangible way, such as scientific experiments and engineering simulations. This technology has been implemented in some Indian technical institutes and universities, improving students' understanding of theoretical concepts and stimulating practical learning.¹

In addition, adaptive learning tools provide accurate analytical reports on student performance, enabling teachers to adjust their teaching methods according to actual results and continuously improve the quality of education. This integration of technology and the educational process promote self-directed learning among students and helps reduce the educational gap between students with different abilities.

✦ Expansion of online learning after the COVID-19 pandemic

The COVID-19 pandemic has accelerated the digital transformation of Indian education, with schools and universities forced to quickly shift to online learning to ensure continuity of education. Platforms such as SWAYAM, DIKSHA and e-Pathshala were adopted to deliver lectures and educational materials, while virtual meeting applications such as Zoom and Google Meet were used to conduct live online classes. This rapid transition contributed to the expansion of digital learning and opened up new horizons for the sustainable development of distance education.

During the pandemic, emphasis was placed on training teachers to use digital learning tools and manage virtual classrooms, as well as providing multimedia content to students to compensate for the loss of face-to-face interaction. Studies have shown that the adoption of online learning has increased student participation and provided equal learning opportunities for learners in remote areas, but it has also highlighted the need to improve digital infrastructure and expand internet access to ensure inclusive education.² It is worth noting that successful experiences during the pandemic have laid the foundation for a new phase in digital education in India, where blended learning has become more widespread, combining traditional classroom learning with online digital education. The pandemic has also

encouraged educational institutions to adopt innovative strategies to improve student engagement, assess performance, and tailor learning to different student abilities.

8. ROLE OF ICT IN ENHANCING EDUCATION IN INDIA

Over the past two decades, the Indian education system has undergone a major transformation towards integrating information and communication technology (ICT) to improve the quality of education, expand access to educational resources, and promote educational inclusiveness. These initiatives have contributed to the development of teaching and learning by providing modern tools and resources that enable both teachers and students to benefit from rich and interactive content, which enhances critical and creative thinking skills and stimulates self-directed and continuous learning. Following are some of the major role of ICT in enhancing education in India:

✦ Development of Teaching and Learning

ICT has played a pivotal role in improving the quality of education in India, both at the school and higher education levels. Digital technologies have enabled teachers to deliver diverse educational content using multimedia such as videos, interactive simulations, and infographics, helping students understand complex concepts more effectively. Digital learning tools such as learning management systems (LMS) have also helped track student progress, provide immediate feedback, and tailor teaching methods to individual student needs. This development in learning methods has led to increased student engagement in the classroom, improved academic achievement, and enabled students to acquire the basic digital skills that have become essential in the modern knowledge economy.

✦ Access to Digital Learning Materials

Access to digital learning materials is one of the most important components of ICT implementation in India. Digital platforms such as e-Pathshala, DIKSHA, and SWAYAM have been developed to provide comprehensive educational content for all levels of schooling, from primary to university education. These platforms offer digital textbooks, interactive resources, educational videos, and self-assessment tools, making it easy for students and teachers to access educational materials anytime, anywhere. These

¹ Awadhesh Singh Gautam, *Role of the new education policy 2020 in 21st century education in India*, International Journal of Applied Research, 27-05-2024.

² Pushpanadham, Karanam, *Massive Open Online Courses: The Emerging Landscape of Digital Learning in India*, International Institute for Educational Planning, 2019.

ICT in Education in India: Progress, Policies, and Challenges

platforms also support multilingualism, allowing students and teachers in different states to use content in their native language, thereby reducing language barriers and contributing to inclusive and equitable education.¹

Furthermore, these platforms provide access to educational content from leading educational institutions, including public universities and open universities such as IGNOU. This allows learners in remote areas or with special circumstances to pursue their education without having to be physically present on campus, promoting equal educational opportunities and reducing the gap between urban and rural areas.

✦ Inclusivity and Accessibility for Diverse Learners

The Indian government has placed particular emphasis on educational inclusivity through the application of ICT, ensuring that educational resources are accessible to all students regardless of their geographical location or socioeconomic background. Digital content has been designed to be available in multiple languages and includes educational tools tailored to the needs of marginalized groups and students with special needs. Digital learning platforms also provide support to teachers through content development tools, training in the use of technology, and strategies to enhance student engagement. All of this contributes to reducing educational gaps between urban and rural areas and between different social classes, ensuring that every student has equal educational opportunities.

In addition, ICT provides tools to personalize learning for each student according to their abilities and level, enabling teachers to use educational data generated by these tools to help improve educational performance and enable informed educational decisions that provide personalized and responsive education. The continuous digital assessment and support effective learning.²

It can be said that the application of ICT in Indian education has contributed to transforming the traditional educational process into a comprehensive, interactive, and personalized learning experience. This transformation has enhanced the quality of education, facilitated access to digital educational resources, and supported continuous learning for all learners. With the continued development of digital infrastructure, teacher training, and expansion of learning platforms, the integration of ICT is expected to lead to a more flexible and effective education system that is capable of meeting the needs of students and teachers in the 21st century.

▪ Blended Learning and Online Learning Approaches

India has also seen widespread adoption of blended learning and online learning approaches, particularly in higher education. Blended learning uses a combination of traditional classroom teaching and digital online learning, providing a flexible and comprehensive educational experience. Programs such as SWAYAM offer online courses (MOOCs) covering various academic disciplines, allowing students to follow digital lectures, participate in forums, and take online tests. These programs are also supported by advanced assessment tools that enable teachers to effectively track student progress and provide them with the necessary support.³

Many Indian universities have also relied on digital learning management systems to provide an interactive learning environment, including digital resources, interactive assignments, and virtual simulation labs. This model has helped develop students' self-learning skills, motivated them to make the most of digital resources, and prepared them for the modern job market, which requires advanced digital skills.⁴

9. CHALLENGES IN IMPLEMENTING ICT IN INDIA

Despite India's significant successes in integrating ICT into its education system, the implementation process faces several structural, technical and regulatory challenges that hinder the full utilization of this technology. Understanding these challenges reflects the need to design comprehensive strategies to address them in order to ensure that digital education reaches all learners and achieves national policy objectives such as the National Policy on Education 2020 and the Digital India program. Some of the most discussed challenges are as follows:

✦ Digital Divide and Regional Disparities

The digital divide is one of the most significant challenges facing the implementation of ICT in Indian education, with significant disparities between urban and rural areas and between different states in terms of access to the internet and digital devices. While schools in major cities have advanced computers and high-speed internet connectivity, rural schools suffer from poor infrastructure,

¹ Ministry of Education, 2024. *DIKSHA: Digital Infrastructure for Knowledge Sharing*. Government of India. Retrieved from Official Website: <https://diksha.gov.in/about/>. (Last visited on 21/10/2025).

² Viji, *Introduction to Digital India*, Government of India, 17/08/2023, Retrieved from: <https://egovernance.vikaspedia.in/viewcontent/egovernance/digital-india/introduction-to-digital-india?lgn=en> (Last Visited on 22/10/2025).

³ Sanjay Kumar, *The role of technology in NEP 2020: Opportunities and challenges*, 2025, International Journal of Advanced Academic Studies Vol. 7, Issue 4, Part B.

⁴ Prasenjit Das, *National Education Policy 2020: Role of Information and Communication Technology (ICT) for Implementing the Modern Education System*, June 2022, Chapter: 17, Publisher: EBH Publishers (India) an imprint of Eastern Book House, 136, M.N. Road, Panbazar, Guwahati- 781001.

ICT in Education in India: Progress, Policies, and Challenges

a lack of devices, and frequent internet outages. This disparity directly affects the ability of students in remote areas to benefit from digital resources and widens the academic achievement gap between students in different regions.¹

Furthermore, students from low-income families face difficulties in accessing digital devices such as computers and tablets, limiting their ability to participate in digital learning. Accordingly, improving digital access is a priority for education policy, including expanding internet coverage, providing affordable devices, and developing initiatives to reach the most disadvantaged students.²

✦ Limited Infrastructure and Connectivity

Limited infrastructure and connectivity are other fundamental challenges to ICT implementation. Many schools, especially in rural and remote states, lack equipped computer labs, Wi-Fi networks, or interactive teaching tools. Poor electricity supply and frequent internet outages also hinder the effective and consistent use of digital platforms. These technical obstacles make it difficult to optimally implement digital education programs such as DIKSHA and e-Pathshala, reducing the effectiveness of digital learning and limiting the benefits for both students and teachers.²

Furthermore, integrating technology into classrooms requires the creation of an integrated learning environment that includes computers, educational software, interactive displays, and digital simulation labs. Due to the high costs involved, some states find it difficult to implement such initiatives on a large scale, resulting in the uneven application of ICT across different educational regions.³

✦ Teacher Competence and Digital Literacy

Teacher competence and digital literacy are among the main challenges facing ICT implementation. Many teachers lack sufficient training to use digital tools effectively in the classroom or to design interactive educational content that meets the diverse needs of students. Some teachers also face psychological resistance or fear of dealing with modern technology, which hinders the integration of ICT into education.⁴

There is no doubt that The Indian government recognizes the importance of training teachers in digital skills through initiatives such as DIKSHA and SWAYAM, which offer progressive training courses to develop teachers' abilities in using technology. However, the challenge remains to cover all teachers at the state level, especially in remote areas, and to ensure that digital knowledge is applied in a practical manner within classrooms.

✦ Curriculum and Assessment Integration Issues

The integration of ICT into curricula and assessment tools poses another challenge in India. Many traditional curricula were not designed to be compatible with digital learning methods, making it difficult for teachers to incorporate digital resources into their daily lessons. Traditional assessment tools also often focus on written tests and theoretical concepts, without taking advantage of digital assessment tools that provide immediate feedback and measure students' critical and creative thinking skills.⁵

Schools and universities also need to develop strategies to assess the effectiveness of digital learning and track student performance across e-learning platforms. This requires the creation of integrated learning management systems (LMS), training teachers to use digital assessment data to improve teaching methods and adapting curricula to the different needs of students.⁶

10. RECOMMENDATIONS FOR PROMOTING THE APPLICATION OF INFORMATION AND COMMUNICATION TECHNOLOGY IN INDIAN EDUCATION

Indian studies and experiences in the field of information and communication technology (ICT) in education have shown that the integration of digital technology enhances the quality of education, expands access to educational resources, and develops the skills of students and teachers. However, these initiatives face multiple challenges related to infrastructure, teacher training, and educational inclusiveness. Based on these analyses, a set of practical recommendations can be offered to enhance the effectiveness of ICT implementation in Indian education, with a focus on policy improvement, infrastructure development, capacity building, and sustainable and inclusive digital education strategies, and they are as follows:

¹ Pushpanadham, Karanam, *Massive Open Online Courses: The Emerging Landscape of Digital Learning in India*, International Institute for Educational Planning, 4 March 2025.

² Chavi Asrani, *Bridging the Digital Divide in India: Barriers to Adoption and Usage*, World Bank Publications, June 2020. ² CRY - Child Rights and You, Education in Rural India: Challenges, Opportunities, Initiatives, May 31, 2024. Retrieved from: <https://www.cry.org/blog/education-in-rural-india/>. (Last visited on 22/10/2025).

³ Sriram Divi, Debendra Nath Dash, Manoj K. Sahoo, *Problems and Challenges of Indian Rural Local Governments in Achieving Sustainable Development Goals: An Analysis of the Viable Perspectives*, International Journal of Sustainable Development and Planning, Vol. 19, No. 7, July 2024, pp. 2455-2464.

⁴ Afnan, *Digital Education in India- Avenues and Challenges*, AIF-The American India Foundation, December 08, 2023. Retrieved from: <https://aif.org/digital-education-in-india-avenues-andchallenges/#:~:text=Lack%20of%20Trained%20Teachers:%20Many,the%20acute%20shortage%20of%20teachers>. (Last visited on 22/10/2025).

⁵ NCERT, 2018, *Use of Educational Technology in Indian Schools*, New Delhi: National Council of Educational Research and Training.

⁶ Ministry of Education, 2020, *National Education Policy 2020*. Government of India. Retrieved from https://www.education.gov.in/sites/upload_files/mhrd/files/NEP_Final_English_0.pdf. (Last visited on 22/10/2025).

ICT in Education in India: Progress, Policies, and Challenges

✦ Policy Improvements

The first and most important recommendation is to strengthen national education policies to adapt to recent technological developments. The Indian government must continuously update legislative and regulatory frameworks to support digital education, including providing adequate funding for ICT initiatives, ensuring the integration of technology into school curricula, and setting clear targets for evaluating the performance of digital programs. It should also focus on developing comprehensive policies to reduce the digital divide between urban and rural areas and ensure that all students, including marginalized groups and those with special needs, have access to digital resources.

✦ Developing Infrastructure and Resources

Improving digital education infrastructure is crucial to ensuring effective ICT implementation. The government must invest in developing computer labs, high-speed internet networks, and modern digital devices in all schools and universities, with a focus on rural and remote areas with poor infrastructure. In addition, interactive teaching tools, simulation software, and advanced digital displays should be provided to support practical and interactive learning.

Digital content must also be regularly updated, and high-quality educational resources developed in local languages to meet the needs of all students. This includes digital books, educational videos, digital assessment tools, and online learning platforms, so that content is easily accessible to teachers and students across the country.

✦ Capacity Building and Teacher Training

Training teachers to use ICT effectively is one of the key factors for successful digital education. Comprehensive training programs should be implemented to develop teachers' digital skills, including designing digital educational content, using interactive learning tools, and managing virtual classrooms. Ongoing support should also be provided to teachers through workshops, advanced courses, and learning platforms for sharing best practices.

Furthermore, teachers should be encouraged to innovate in their use of technology in the classroom and to apply blended and adaptive learning methods that allow for the personalization of learning according to students' different abilities. This continuous training contributes to raising teacher efficiency, improving the quality of education, and enhancing students' ability to learn independently and acquire 21st-century skills.

✦ Sustainable and Inclusive Digital Education Strategies

It is important to adopt sustainable and inclusive digital education strategies to ensure the continued impact of ICT on education in India. This includes adopting a blended learning model that combines traditional and digital education, allowing greater flexibility for students and teachers and promoting student engagement. Integrated learning management systems (LMS) should also be developed to track student performance, provide immediate feedback, and continuously improve the educational process.

There should also be a focus on educational inclusivity by designing multilingual digital content, providing appropriate learning tools for students with special needs, and ensuring that educational resources are accessible to all socio-economic groups. This contributes to reducing the educational gap between urban and rural areas and achieves national policy goals related to inclusive education and equal educational opportunities.

Furthermore, sustainable digital education can be promoted by supporting ICT research and innovation and encouraging universities and schools to test new educational tools and technologies such as artificial intelligence, virtual reality, and adaptive learning tools. These innovations contribute to a more interactive and personalized learning experience and improve students' analytical, creative, and problem-solving skills.

11. CONCLUSION

India's experience in applying information and communication technology in education shows a profound strategic shift that reflects the state's commitment to developing a comprehensive and sustainable digital education system. From the beginnings of educational radio broadcasting in the 1930s, through television experiments and early computing initiatives, to the contemporary digital revolution following the COVID-19 pandemic, India's educational infrastructure and policies have evolved significantly with the aim of improving the quality of education and expanding access to it. National policies, such as the National Policy on Education (1986, 1992, 2020) and the National Policy on Information and Communication Technology in Education (2012), have formed the legislative and administrative basis for the deployment of technology in the education system.

Major national initiatives such as the National Mission on Education through ICT (NMEICT), the SWAYAM and DIKSHA programmes, and the e-Pathshala platform under the Digital India programme have enabled millions of students and teachers to access integrated digital learning resources. This, in turn, has promoted distance education and self-learning, and reduced disparities between urban and rural areas.

On the other hand, institutional experiments such as the Indian Institutes of Technology (IITs), the Indian National Open University (IGNOU), and state initiatives in Kerala, Delhi, and Karnataka have demonstrated their effectiveness in implementing effective digital learning projects, making them role models in India and around the world. Public-private partnerships have also contributed to the development of innovative digital content and supported start-ups in the field of educational technology.

ICT in Education in India: Progress, Policies, and Challenges

Despite these successes, challenges remain, most notably weak infrastructure in rural areas, lack of digital training for teachers, and difficulty in integrating curricula with modern assessment tools. The COVID-19 pandemic has revealed the urgent need to enhance digital readiness and ensure equity in educational opportunities.

In conclusion, reality confirms that the future of education in India depends on an integrated national strategy that includes modernizing education policies, building digital infrastructure, developing teachers' skills, and encouraging innovation through modern technologies such as artificial intelligence and virtual reality. Through this path, India is steadily moving towards building a digital knowledge society capable of achieving sustainable development and keeping pace with the demands of the 21st century.

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ICT in Education in India: Progress, Policies, and Challenges

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