

Digital Transformation in Indian Pedagogy: A Critical Appraisal of Technology Integration and Future Trajectories under NEP 2020Reecha Jral¹, Paramjeet Kour², Ajayshree Dev Singh Sambyal³, Abhimanyu Dev Singh Billawaria⁴, Neeru Choudhary⁵, Vinay kesar⁶, Kuljeet Singh⁷¹Assistant Professor, School of Teacher Education, Cluster University of Jammu, J&K²School of Teacher Education, Cluster University of Jammu, J&K³Lecturer, Department of History, Gov't Degree College, Kunjwani, Jammu, J&K.⁴Department of English, Nava Nalanda Mahavihara.⁵Department of Buddhist Studies, University of Jammu, India⁶Department of Management Studies, University of Jammu, J&K⁷Lecturer History, GDC Boys Udhampur

Corresponding authors' email id: reechajrall@gmail.com, paramjeetkourhgr@gmail.com, abillawaria@gmail.com,
ajaysambyal21@gmail.com,
drneeruchoudhary777@gmail.com
vinaykesarumba@gmail.com
singh.kuljeet1991@gmail.com

Abstract

We have entered an era characterized by the convergence of emerging communication and information technologies. To thrive and endure in the competitive realm of education, it is imperative to develop, embrace, and implement innovative educational technologies. Indian enterprises play a pivotal role in the progression of ICT and other critical sectors, including space exploration. The Digital India Campaign aims at establishing a digitally empowered society and knowledge economy across the nation. NEP 2020 represents a pivotal advancement in education by highlighting the use of technology to enhance many aspects of education and to augment transparency and rigor in educational processes overall. The NEP 2020 underscores the utilization and integration of technology to enhance many facets of education, while also maintaining rigor and openness in the educational process, including its expansion. This framework encompasses competencies, portfolios, rubrics, standardized exams, and analytical evaluations. This study aims to examine the technical framework outlined in NEP 2020, focusing on how these recommendations will alter the trajectory of educational discourse in the future.

Keywords: E-Learning, NEP 2020, NEFT, PARAKH, Blended Learning, E-Content.

Introduction

The New Education Policy (NEP) 2020, recently introduced during the COVID-19 epidemic, underscores the importance of technology in education. The development of e-courses in regional languages and the establishment of virtual labs is planned through the National Educational Technology Forum (NETF). The 2020 education program mandates the creation of e-content in many regional languages in addition to English and Hindi. Ministry officials intend to employ technology in educational planning, learning, and assessment, among other applications. Following the transformation of India's HRD Ministry into the Education Ministry in July 2020, the National Education Policy of 2020 introduced a groundbreaking rule affecting the Indian education system. This strategy addresses all facets of schooling and incorporates technology throughout. A multitude of instructors nationwide have embraced the NEP, asserting that it was long anticipated. Indian civilization has transformed into an information-centric society in recent years, making the integration of technology in the education sector essential. The NEP 2020 asserts the incorporation of technology in education. In light of the ongoing pandemic, during which virtual learning has become standard, it is imperative to reassess conventional teaching and learning methodologies. A model for education was devised to establish an independent India. An e-education unit and the National Educational Technology Forum (NETF) will be established to enhance digital content, infrastructure, and capacity development under the new policy. Through the integration of NETF, artificial intelligence, and computer literacy, hardware and software will be amalgamated in education at all levels, thereby fostering student learning, enhancing their progress, and aiding teachers in cultivating administrative and managerial competencies.

Objectives of Study

- To investigate the digital initiative in education as outlined in NEP 2020
- To examine the altered function of educators in accordance with the directives for technology in NEP 2020,
- To ascertain the anticipated modifications in content delivery and assessment methodologies following the execution of NEP 2020.

Methodology

The primary objective of this study is to examine the NEP 2020 document to explore the digital initiatives in education. It is partitioned into three segments:

1. Analysis of the NEP 2020 Document.
2. NEP 2020 and technological models
3. Meta-analysis of existing studies on NEP 2020, specifically focusing on technology initiatives, particularly addressing the transformation of the teacher's role and the teaching process following the adoption of NEP 2020. The initial segment of the study is predicated on a content analysis of the NEP 2020 document. This analysis aimed to examine the integration of technology into the teaching and learning process as specified in the policy. The investigator meticulously analyzed the paper to discern the diverse efforts and tactics established to facilitate the effective deployment of a technology-enhanced teaching and learning environment. The second section delineates NEP 2020 in relation to models for integrating technology into the teaching and learning process. The core of NEP 2020's vision is the incorporation of technology to improve educational experiences. The policy underscores the importance of digital literacy, blended learning paradigms, and technological utilization to enhance accessibility, equity, and educational quality nationwide. Diverse frameworks for technology integration, including the SAMR (Substitution, Augmentation, Modification, Redefinition) model, the TPACK (Technological Pedagogical Content Knowledge) framework, and the Constructivist Technology Model, offer educators systematic methodologies for comprehending the seamless incorporation of technology into pedagogical practices. A meta-analysis was conducted in the third section to comprehensively review the published literature on NEP 2020. The investigation examined how the operational aspects of NEP 2020 transformed the role of the teacher, content delivery, and assessment and evaluation following its implementation. The review comprised the study completed on NEP 2020 from its implementation to the present date (i.e., from 2020 to 2024). Original articles published in the journals were selected based on two criteria: (1) the implementation of NEP 2020 transformed the role of the teacher from traditional to conventional teaching-learning systems. Reformation in content delivery and assessment following NEP 2020. It delineates the transformation of the teacher's job from a mere information provider to a resourceful educator who is now a content creator, content provider, and adept in utilizing technology in education following the adoption of NEP 2020.

Inferences from NEP 2020 Regarding Technology Integration in Education

Section one focuses on the digital components of NEP 2020, illustrating the integration of technology into the educational framework and outlining methods for reforming and modernizing the education system through e-learning and e-evaluation resources. It also emphasizes the importance of digital learning in all facets of the educational system. It underscores the necessity for educators to be proficiently trained in the appropriate integration of technology into their pedagogical methods. The NEP 2020 statement underscores the necessity of offering professional development opportunities for educators to augment their digital literacy competencies and pedagogical expertise.

Technology Plays An Essential Role In Educating Students:

The incorporation of technology in Indian school education is a crucial component of NEP 2020, aimed at enhancing classroom operations and facilitating educator professional development. Furthermore, enhanced educational opportunities will be accessible to marginalized populations and children with special needs. Furthermore, Indian educational institutions will increasingly leverage technology for educational planning, administration, and management in the forthcoming years. In addition to using technology, the school curriculum was reformed to substitute the 10+2 model with a 5+3+3+4 framework (Wadhwa and Kumar 2022). Human Resource Development sources say that the NEP 2020 will incorporate additional e-learning choices in schools and institutions to enhance its technological orientation. The initiative aligns with the MHRD's existing strategy of educating kids via a variety of electronic materials due to the lockdown. The integration of technology in the education industry, including online courses, educational portals, and class-specific broadcasts on educational channels, has significantly focused on improving learning and adaptation. The government has recommended platforms like as DIKSHA, SWAYAM, and E-Pathshala for college and school students due to the prolonged closure of educational facilities. Every classroom has access to the latest technology, and 100 leading colleges will be encouraged to operate in foreign nations (Aithal and Aithal, 2020).

Incorporation of technology inside educational establishments

In the contemporary technological era, educators receive support through technology, addressing language barriers between teachers and pupils, establishing digital libraries, and enhancing educational accessibility, particularly for children with special needs.

- Each classroom shall have access to the most current educational technology to facilitate an enhanced learning experience.
- Students must acquire coding skills in the classroom as an essential competency. Technology-driven educator training effectively facilitates this integration.
- Professional and Higher Education
- Varied learning modalities are essential to get this technology-driven education. Technology plays a crucial role in tackling diverse difficulties and supporting multidisciplinary research and innovation. The National Research Foundation should be responsible for administering research, whereas incubators and technology centers should be formed by higher education institutions. The NEP 2020 stipulates the establishment of a National Educational Technology Forum (NETF) to facilitate the unimpeded exchange of ideas regarding the administration and assessment of technology in education.

Measures taken by NEP 2020 for Effective Integration of Technology in Education System: The policy of implementation and incorporation of digital technology in the educational process from primary to tertiary education proposed several actions outlined below.

Pilot Studies for Online Education:

The NEP designated suitable organizations, including NETF, CIET, NIOS, IGNOU, IITs, and NITs, to undertake a series of concurrent studies. The objective of the study is to assess the successful integration of online education with traditional education while addressing potential drawbacks, as well as to examine associated concerns such as student device addiction and preferred formats for electronic information. Educational institutions will utilize the findings from these pilot studies for ongoing enhancement and disseminate them to the public. Educators in Delhi have utilized **Google Docs** and **Microsoft Teams** for collaborative projects, enabling students to collaborate in teams, exchange materials, and co-develop presentations or reports on subjects such as environmental concerns or cultural heritage (Gupta, 2021).

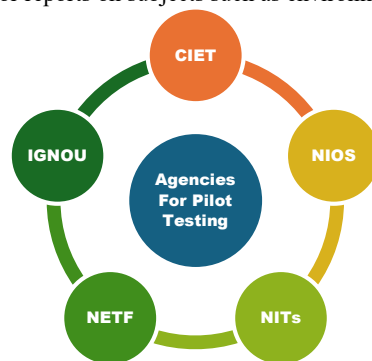


Illustration 1. represent the agencies for pilot studies

Digital Infrastructure

Investment is necessary for the open, evolvable, and interoperable development of general digital infrastructure in the educational sector. To identify solutions for diversity and complexity within the Indian context, ensuring that technology-dependent solutions remain relevant over time. (H, M, 2021)

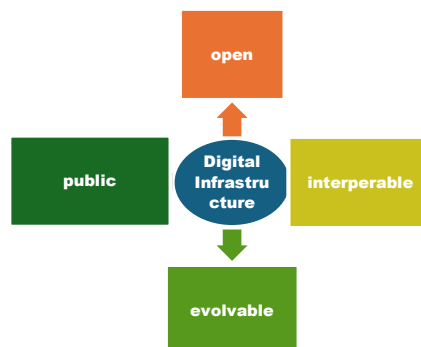


Illustration 2. exhibiting attributes of digital infrastructure within educational institutions

Digital Instructional Platform and Resources: Swayam and Diksha will offer enhanced functionalities to educators, enabling them to track student progress via structured and user-friendly assistive technologies, including a two-way video-audio interface to address the pandemic scenario.

Content Development, Digital Archive, and Distribution: Coursework, educational games, and simulations are incorporated into a digital repository. Virtual reality should be advanced for efficacy and excellence. The gamification of Indian art and culture, presented in different languages, serves as an effective mechanism for the trustworthy diffusion of electronic content to pupils.

Tackling the Digital Divide: Technology is extensively utilized in various sectors, including education. However, there exists a population of learners who cannot access technology treatments, or have very limited access to them. Mass media, including television, radio, and community radio, shall be utilized to disseminate educational programs that provide 24/7 broadcast services tailored to the diverse requirements of students accessing them. There will be a significant focus on content in all Indian languages; digital content must be accessible to instructors and students in their medium of instruction.

Virtual Laboratories: DIKSHA, SWAYAM, and SWAYAM PRABHA also offer enhanced functionalities, including virtual laboratories. These laboratories have been created to provide students with hands-on experience and high-quality practicals that are easily accessible for experiment-based learning. The provision of accessible rights for students and teachers will be facilitated with appropriate digital technology, including tablets equipped with pre-loaded content.

Preparation and Motivation for Educators: NEP 2020 mandates that educators possess comprehensive training in learner-centered pedagogy, alongside the ability to develop exceptional online content and utilize online teaching platforms and technologies. The teacher's role in promoting dynamic student engagement with the topic and with one another might be highlighted.

Digital Evaluations and Examinations: School Boards, NTA, and other relevant entities formulate and execute an assessment framework incorporating competencies, portfolios, rubrics, standardized exams, and assessment analytics. These guidelines are established by an agency known as PARAKH, the proposed National Assessment Centre. A novel evaluation method has been created utilizing educational technology that emphasizes 21st-century competencies. Blended learning models: The significance of in-person education and training is recognized, while digital learning and education are encouraged. The potential for research in technology-supported learning, such as NEFT and other regulatory bodies, aims to produce content and pedagogy, thereby facilitating the establishment of guidelines for e-learning in educational institutions.

Academic Bank of Credits: The credits acquired from higher educational institutions are digitally kept in the Academic Bank of Credits, which are utilized to facilitate degree conferral throughout time (Kurien and Chandramana, 2020). The emphasis on technology enhances the efficiency and transparency of regulatory bodies overseeing educational institutions and processes, such as state agencies and the Higher Education Commission of India. The four administrative bodies of education are NAC (National Accreditation), HEGC (Higher Education Grants Council), NHERC (National Higher Education Regulatory Council), and GEC (General Education Council) (Malik, 2021).

Adjusting to Artificial Intelligence: The policy acknowledges the difficulties arising from the extensive use of technology and addresses the financial concerns associated with the deployment of artificial intelligence across several sectors.

Developing Web-Based Presentation Platforms and Tools: Developing virtual laboratories and digital repositories while teaching educators to become proficient online content creators.

Strategizing and implementing web assessments. Establishing quality principles for content and innovation in web-based education necessitates acknowledgment of the transformative role of NEP 2020 in integrating technology into the Indian education system; however, it also presents certain concerns and challenges that must not be overlooked.

NEP-2020 expresses significant worry on the credibility of teachers. Numerous teaching vacancies exist in universities, colleges, and schools, including several full-time roles occupied by part-time personnel. When part-time educators receive no rewards for their commendable efforts, we cannot anticipate their full commitment (Kumar, 2020). Recruiting educators, facilitating ongoing professional development, and establishing a conducive work atmosphere and favorable service conditions are vital to the teaching and learning process. Rao & Rao (2019). The Indian government has incorporated internationalization into its education policy for the first time. A primary objective is to establish India as a knowledge hub that draws foreign nations and fosters research collaboration between Indian and global institutions. Foreign students graduating from Indian colleges will acquire understanding of Indian culture, strengths, and regulations, which will facilitate the enhancement of business in education and other areas. (Jha, Jha & Jha, 2020). Each semester, a minimum of two SWAYAM online courses must be made available to all students (Aithal and Aithal 2020). To guarantee that distance learning matches the caliber of the most esteemed in-person programs, various initiatives will be implemented, including the provision of online networking courses, digital repositories, financial support for research projects, and enhancements to student services. Numerous educators, especially in urban institutions, are utilizing online certification courses on platforms such as Coursera and edX to remain abreast of educational trends and technologies (Desai, 2021).

SECTION II

This section delineates the implementation of NEP 2020's recommendation for technology integration in the teaching-learning process, aligned with paradigms of technological intervention in education. The three primary models underpinning the NEP 2020 covered in this section. The SAMR model was developed by Ruben R. Puentedura provides educators with a systematic framework for the efficient integration of technology. It represents substitution, augmentation, modification, and redefinition. The SAMR model (Substitution, Augmentation, Modification, and Redefinition) offers a valuable framework for comprehending the progression of technology integration in the classroom, from basic tools to transformative educational experiences. The technological integration specified in NEP 2020 (National Education Policy 2020) aligns with each tier of the SAMR model, reflecting the policy's objectives and vision. At the Substitution level, technology supplants conventional classroom instruments without altering the essence of the activity. During this phase, technology serves merely as a digital substitute for conventional teaching and learning methods. The NEP 2020 underscores the importance of enhancing access to digital infrastructure, including as gadgets and internet connectivity, to facilitate education. At the Substitution level, students may utilize e-textbooks in lieu of physical textbooks or online portals for assignment submission instead of conventional paper-based methods. During the Augmentation stage, technology replaces conventional tools while providing expanded functionalities that enrich the learning experience, including more engagement, real-time feedback, and more efficient processes. NEP 2020 promotes blended learning, integrating in-person and online education. Technologies like as interactive quizzes (e.g., Kahoot!, Quizlet), video content, and virtual chats enhance traditional approaches by rendering the learning experience more interesting and participatory. During the Modification stage, technology facilitates significant rethinking of the activity. New digital tools and methodologies facilitate collaboration, enhanced engagement, and interactive experiences. The policy underscores the utilization of virtual labs and simulations for disciplines such as science and mathematics, allowing students to conduct experiments or resolve problems in a virtual environment. Tools such as Labster and PhET facilitate transformative experiences by presenting innovative methods of engaging with knowledge that were unattainable in conventional classrooms. During the Redefinition phase, technology facilitates the development of whole new tasks that were previously unimaginable without it. This level signifies the pinnacle of technology integration, wherein learning is revolutionized, facilitating novel educational experiences. The NEP 2020 aspires to establish global learning ecosystems, enabling students to partake in virtual exchanges, attend online seminars, or engage in MOOCs (Massive Open Online Courses). This grants access to varied

educational resources and international viewpoints, enabling students to learn from professionals and peers globally, surpassing geographical limitations. Platforms such as SWAYAM and DIKSHA provide professional development courses designed to enhance digital competencies and pedagogical methodologies. Consequently, educators must transform into perpetual learners, continuously adjusting to novel pedagogical techniques and technologies (Pandey & Kumar, 2021).

Technological Pedagogical Content Knowledge (TPACK) The TPACK framework was established by Punya Mishra and Matthew J. Koehler in 2006. Emphasis is focused on technological knowledge (TK), pedagogical knowledge (PK), and content knowledge (CK), offering a beneficial framework for tackling the issues educators have when incorporating educational technology (edtech) into their teaching methods. The TPACK framework delineates three knowledge domains, demonstrating that both content (subject matter) and pedagogy (teaching methods) are vital for effective edtech deployment. The National Educational Technology Forum (NETF), as delineated in NEP 2020, promotes teacher training programs aimed at enhancing technology literacy, ensuring that educators obtain the requisite technological skills for effective instruction. The NEP prioritizes student-centered education, promoting active engagement, collaborative learning, and problem-solving skills. Digital tools can augment these methodologies by offering interactive activities, virtual simulations, and instantaneous feedback. The National Education Policy (NEP) 2020 advocates for the utilization of digital content and Open Educational Resources (OERs) to guarantee that learning materials are accessible, inclusive, and adaptable. This encompasses interactive textbooks, movies, simulations, and multimedia materials.

The policy endorses the utilization of virtual laboratories and simulations to instruct science, mathematics, and other disciplines, thereby rendering abstract concepts more tangible and comprehensible for pupils. The NEP 2020 proposes customized learning, wherein technology adjusts to the need of each learner. Utilizing appropriate technical tools, educators can develop learning experiences customized to students' strengths and weaknesses, in accordance with the TPACK framework, which integrates content and pedagogy with suitable digital technologies. Educators are urged to augment their TPACK competences, guaranteeing they possess the knowledge and skills necessary for the appropriate integration of technology into their instruction. This may encompass training on utilizing technology to successfully deliver curriculum and engage students. For instance, in a history lesson, an instructor with robust Content Knowledge in history may utilize historical videos and interactive timelines (Technology) while implementing inquiry-based learning methodologies (Pedagogy) to enhance student engagement and comprehension. This exemplifies a direct application of TPACK, wherein the educator's integrated knowledge of technology, pedagogy, and content enriches the learning experience, aligning with the objectives of NEP 2020. NEP 2020 delineates the framework and vision for infrastructure, content, and educator development, whereas TPACK emphasizes the amalgamation of pedagogical practices with technological tools to augment the teaching-learning process.

Constructive Technology Model: The Constructivist Technology Model is based on constructivism, a learning theory wherein individuals develop their own understanding and knowledge via experiences and interactions with their environment. This paradigm prioritizes active learning, collaborative learning, and the integration of technology to augment students' involvement, critical thinking, and problem-solving skills. The NEP 2020 advocates for a learner-centric paradigm, positioning students at the core of the educational process. The policy advocates for the implementation of innovative pedagogical techniques and technical resources to enhance critical thinking, creativity, and problem-solving abilities. This method aligns with constructivist concepts emphasizing the active participation of students in shaping their own learning experiences.

SECTION III

The part states that a primary consideration following the introduction of NEP 2020 is the transformation of the teaching-learning process. In addition to instruction, educators are increasingly tasked with content creation and the development of online platforms. Furthermore, lesson delivery has transitioned from a singular form to several modes, departing from conventional e-learning methodologies.

Role of Teacher: The NPE 2020 also highlighted the transformative function of the teacher. The policy clearly indicates that in the forthcoming years, the function of instructors will evolve; they will no longer be just providers of knowledge but will also serve as content creators, disseminators, and technical supporters. For instance, by adopting 'flipped classrooms,' lectures can be pre-recorded and disseminated as videos, enabling class time to focus on discussions regarding the practical application of the knowledge. Furthermore, educators can utilize technology to tackle the challenge of standardized learning. AI-powered learning tools enable teachers to tailor training and assessments for each student (Rayees et al, 2023). Digital training is crucial in digital education to prepare professionals with the necessary skills to become proficient and effective online educators, as well as to teach successfully in blended learning contexts. Moreover, the pedagogy of instruction has been modified to address the particular needs of students in the digital learning environment, as stipulated by the National Policy of Education 2020 (Behra, 2020). To guarantee a thorough educational experience for pupils, it is essential for educators to integrate technology into instruction, including digital literacy, scientific reasoning, and computational thinking (Mahanta, 2023).

Facilitator of Learning: Educators are no longer the exclusive purveyors of knowledge. They transform into facilitators of learning, directing students through digital resources, collaboration technologies, and interactive content. Educators employ technology to develop customized learning experiences tailored to students' unique requirements and learning preferences. An educator use AI-driven platforms such as Byju's or Khan Academy, enabling students to learn at their own speed. The teacher prioritizes resolving inquiries, steering group conversations, and fostering deeper understanding during class time, rather than merely presenting the material.

Mentor and Coach: Educators are increasingly dedicating time to mentor students, offering emotional support, and helping them through independent or project-based learning. Technology alleviates time devoted to administrative duties, facilitating increased individual student engagement. A teacher can utilize digital portfolios to monitor student progress over time, facilitating more substantive talks regarding personal development, problems, and opportunities for enhancement.

Continuous Learner: Educators are anticipated to perpetually enhance their digital literacy and pedagogical competencies to accommodate evolving technologies. This may include ongoing online professional development courses, such as those provided by platforms like DIKSHA or SWAYAM. Hybrid learning methods, which integrate both in-person and digital instruction, have emerged as a significant strategy. A teacher completes an online course on utilizing virtual laboratories in science education and then integrates interactive simulations into courses to facilitate students' comprehension of intricate scientific ideas. Consequently, educators are required to oversee various instructional methods and provide captivating, technology-enhanced materials that correspond with a range of learning requirements. This transition necessitates that educators possess expertise in utilizing digital instructional resources to develop engaging lesson plans (Kumar, 2021). Numerous urban schools have implemented hybrid classrooms, wherein some students participate in-person and others engage remotely. Educators utilize Zoom or Google Meet for live sessions, while all instructional materials are disseminated via Google Classroom or Moodle, facilitating student engagement with content irrespective of their geographical location (Soni, 2021).

Delivery of Lessons or Courses; The NPE 2020 stipulates that course delivery will be digitized and blended learning methods would be employed in classrooms. The integration of two-way audio-visual technology for online education is a key aspect of NEP 2020. Television and community radio programs are available 24/7 in regional languages for pupils with limited access to online education (Devi, 2021). Schools using NEP 2020 have introduced flipped classrooms to improve participation. In flipped classrooms, students receive instructional content online at home and participate in interactive activities or conversations in the classroom, with the teacher serving as a facilitator rather than a lecturer (Patel, 2020).

Blended Learning: The conventional classroom will transform into a blended learning environment, integrating online and offline education. Educators will utilize both face-to-face and digital mediums to present content, enabling students to interact with learning resources prior to, during, and subsequent to class. Numerous educators, especially in urban institutions, are employing online certification programs on platforms such as Coursera and edX to remain informed about educational trends and technologies. A mathematics instructor provides a video on a subject (e.g., algebra) for students to see at home, thereafter conducting problem-solving sessions in class, utilizing interactive tools such as Desmos to examine various answers and facilitate real-time discussions.

Interactive and Immersive Learning: Utilizing techniques such as virtual reality (VR) and augmented reality (AR), educators can develop engaging learning experiences. Students can investigate historical events using virtual reality, perform virtual scientific experiments, or traverse the solar system in three dimensions. In geography classes, students utilize an augmented reality application to examine continents, analyze geographical features, and digitally access distant areas for enhanced comprehension of ideas.

Assessment and Evaluation: The revised NEP 2020 indicates that boards may develop more "viable models" of examinations throughout time, encompassing annual, semester-based, or modular formats. Examinations will consist of two formats: objective examinations or descriptive assessments, applicable to all courses, starting with Mathematics. The Performance Assessment, Review, and Analysis of Knowledge for Holistic Development (PARAKH) will be established as a national assessment center to serve as a standard-setting authority for establishing norms, standards, and guidelines for student assessment and evaluation across all recognized school boards. Additionally, a digital repository named the Academic Bank of Credit (ABC) will be created to securely store academic credits acquired from accredited Higher Education Institutions (HEIs). This will facilitate the uninterrupted conferral of degrees by higher education institutions, taking into account the credits accumulated by students (Bhardwaj et al, 2021). The aim of NEP 2020 is to transform the methodology of learning evaluations. Schools have transitioned to digital portfolios, enabling students to submit projects and assignments electronically, while teachers offer immediate feedback via platforms such as Seesaw (Sengupta, 2022). These digital platforms provide continuous and individualized assessments. Rather than depending on summative assessments that primarily evaluate memorizing skills, the new approach incorporated: (Lead, 2021)

1. More frequent and developmental in character,
2. Emphasizing competency-based assessments ,
3. Aimed at evaluating advanced skills such as analysis, critical thinking, and conceptual understanding. Technology provides numerous chances to improve and streamline the assessment process, such as online examinations, computer-based assessments, AI-driven online proctoring, and adaptive testing (Somani, 2023).

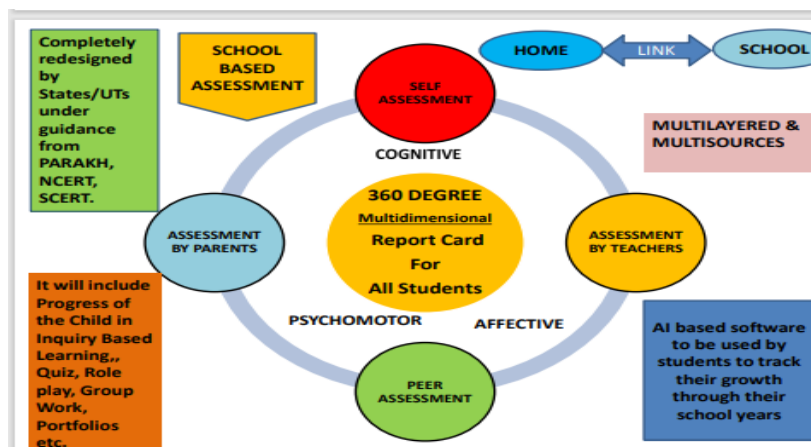


Figure3 interpreting the 360 degree multidimensional report card.

NEP 2020 promotes a transition from rote memorization and high-stakes assessments to a more comprehensive evaluation framework. Technology-enhanced assessments, including online quizzes, automated feedback systems, and AI-driven individualized learning pathways, are increasingly utilized for evaluating student performance. These tools offer immediate feedback and monitor student progress, facilitating a more ongoing and formative evaluation methodology. This transition allows educators to assess pupils on diverse competencies, such as critical thinking, problem-solving, and creativity, rather of solely on knowledge recall (Kumar & Yadav, 2021).

Formative & Continuous Assessment: The emphasis will shift from high-stakes summative examinations to continuous, formative evaluations. Digital platforms facilitate the ongoing evaluation of students' comprehension and abilities by means of quizzes, assignments, and collaborative projects. A teacher use applications such as Quizizz or Google Forms to administer quizzes consistently and provides prompt feedback to pupils. This ongoing evaluation enables the educator to monitor pupils' advancement and deliver prompt interventions.

Data-Driven Insights: Technology facilitates educators in gathering data regarding students' advancement and performance via Learning Management Systems (LMS) or student information systems. Educators can utilize this data to make informed decisions on student learning and customize treatments more efficiently. An AI-driven system monitors the duration pupils engage with various subjects and their quiz performance, furnishing educators with comprehensive reports. Educators can discern areas of student difficulty and provide focused assistance or modify the curriculum as needed.

Project-Based and Peer Assessments: Digital tools enable collaborative projects and peer evaluations, which are increasingly vital for assessing students' problem-solving and teamwork competencies. Technology facilitates remote collaboration among students, enabling them to share their work and assess one another's contributions. In a history lesson, students from several schools can collaborate online on a research assignment, develop a joint presentation on Padlet, and offer feedback to each other via an online peer-review system.

Innovative Solutions and Implementation: The above discussion and findings underscore some creative methods and frameworks that could be feasibly adopted in accordance with the technology usage requirements of the National Education Policy (NEP) 2020, as outlined below:

1. **Digital Classrooms:** Furnish classrooms with smart boards, projectors, and interactive displays to enhance engaging and interactive learning experiences. This may encompass multimedia content, virtual laboratories, and real-time collaborative tools.
2. **.AI-Enhanced Education:** Utilize AI-driven tools for individualized learning, adaptive assessments, and intelligent tutoring systems. These tools can assess student performance and deliver tailored comments and assistance.
3. **Utilize Virtual Reality (VR) and Augmented Reality (AR)** to develop immersive educational experiences, including virtual excursions, simulations, and interactive three-dimensional models. This can improve comprehension of intricate concepts and render studying more stimulating.

4. **Online Learning Platforms:** Enhance the use of platforms such as DIKSHA and SWAYAM to provide access to superior educational resources, encompassing MOOCs (Massive Open Online Courses), e-books, and video lectures.
5. **Blended Learning Models:** Integrate conventional classroom instruction with online education to establish a blended learning environment. This offers adaptability, accommodates various learning modalities, and guarantees the continuance of teaching throughout interruptions.
6. **Teacher Training Programs:** Create extensive training initiatives for educators to improve their digital literacy and instructional competencies. This may encompass workshops, online courses, and practical training using emerging technology.
7. **Digital Libraries and Repositories:** Establish digital libraries and repositories that are available to all students, offering a plethora of information in many languages. This can facilitate communication among diverse linguistic groups and guarantee equitable access to information.
8. **Integrate collaboration tools** such as Google Workspace, Microsoft Teams, and other platforms to enhance group projects, peer learning, and communication between students and educators.
9. Integrate **gamification** components into the curriculum to enhance the enjoyment and engagement of the learning experience. This may encompass educational games, quizzes, and incentive systems to engage pupils.
10. Utilize **data analytics** to track student development, pinpoint areas for enhancement, and implement data-informed decisions to improve educational results.

Conclusion: The Government of India has introduced the draft of the National Education Policy 2020. The Indian government emphasizes an integrated learning strategy in its educational policy, utilizing technology to enhance education and expand online learning options. The government directs agencies such as IGNOU, NETF, CIET, NIOSTE, IITs, and NITs. Concurrently with the identified pilot studies, additional pilot studies will be undertaken to assess the feasibility of integrating education with online learning while addressing its deficiencies, as well as exploring study-related concerns, including student device addiction and preferred e-content formats among students. The outcomes of these pilot projects will be disclosed and utilized for the ongoing enhancement of the program. The government is developing a digital material library that will encompass coursework, educational games and simulations, virtual reality, augmented reality, and user evaluations to measure effectiveness and quality.

References

1. Aithal PS, Aithal S. Analysis of the Indian National Education Policy 2020 towards Achieving its Objectives. *Int J Manag Technol Soc Sci.* 2020;5(2):19-41. doi: 10.5281/zenodo.3988767.
2. Aithal PS, Aithal S. Analysis of the Indian National Education Policy 2020 towards Achieving its Objectives. Mangalore: College of Management & Commerce, Srinivas University; 2020.
3. Bansal A, Bhatnagar R. The role of technology in transforming the Indian education system: NEP 2020 and beyond. *J Educ Technol Soc.* 2020;23(1):12-25.
4. Bardhwaj R, Bardhwaj A, Bardhwaj S, Bardhwaj P. A Critical Evaluation of New Education Policy 2020: Challenges and Opportunities. In: National Virtual Conference "New Education Policy: A Quality Enhancer for Inculcation of Human Values in Higher Education Institutions". Chennai: AMET University; 2021.
5. Behera B. National Education Policy (NEP) – 2020, Technology Use and Integration & Online and Digital Education: Ensuring Equitable Use of Technology [Internet]. New Delhi: CIET, NCERT; 2020 [cited 2026 Mar 17]. Available from: https://education.gov.in/sites/upload_files/mhrd/files/NEP_2020_CIET_Behera.pdf
6. Desai P. The evolving role of teachers in a digital learning ecosystem: Impact of NEP 2020. *J Educ Res Pract.* 2021;13(2):45-59.
7. Devi U. Online Education in NEP 2020: Benefits and Challenges. *Int Res J Commer Arts Sci.* 2021;12(9):91-96. doi: 10.32804/CASIRJ.
8. Gupta R. Collaborative learning and project-based pedagogy in the NEP 2020 framework: A case study of urban schools. *Innov Teach Learn J.* 2021;12(3):80-94.
9. Jha J, Jha R, Jha K. National Education Policy 2020: A Step towards Technology Driven Education and Self-reliant India. *Solid State Technol.* 2020;63(6).
10. Kalyani P. An Empirical Study on NEP 2020 [National Education Policy] with Special Reference to the Future of Indian Education System and Its effects on the Stakeholders. *J Manag Eng Inf Technol.* 2020;7(5).
11. Khatak S, Wadhwa N, Kumar R. NEP, 2020-A Review cum Survey Based Analysis of Myths and Reality of Education in India. *Int J Adv Manag Technol Eng Sci.* 2022;12(1).
12. Kumar D. A Critical Analysis and a Glimpse of New Education Policy -2020. *Int J Sci Eng Res.* 2020 Oct;11(10):248-255.
13. Kumar V, Yadav P. AI and adaptive learning: Revolutionizing assessment and feedback systems under NEP 2020. *Int J Educ Technol.* 2021;18(4):56-70.
14. Kuriën A, Chandramana SB. Impact of New Education Policy 2020 on Higher Education. In: *Atma Nirbhar Bharat: A Roadmap to Self-reliant India.* Thiruvalla; 2020.
15. Lead School. What are the NEP 2020 Exams & Assessment Reforms [Internet]. 2021 [cited 2026 Mar 17]. Available from: <https://leadschool.in/>
16. Mahanta B. Recommendations and Challenges of Teacher Education in NEP- 2020. *J Emerg Technol Innov Res.* 2023;10(5):88-92.
17. Malik S. National Education Policy 2020 and Its Comparative Analysis with RTE. *Am Res J Humanit Soc Sci.* 2021;7(1). doi: 10.21694/2378-7031.21003.
18. Nair S, Sreedhar K. Teacher professional development in the digital age: Challenges and opportunities under NEP 2020. *Indian J Teach Educ.* 2020;22(4):38-51.
19. Naveen HM. NEP, 2020: Curricular and Pedagogical Reforms for Online and Digital Education. *Int J Sci Res Sci Eng Technol.* 2021;8(3):411-420. doi: 10.32628/IJSRSET.
20. Patel R. Student-centered learning in the NEP 2020 framework: The role of technology. *J Pedagog Stud.* 2020;14(2):120-134.
21. Rayees R, Dar RA, Tehseena J. Changing Role of Teacher Educators in View of NEP 2020. *J Xi'an Univ Archit Technol.* 2023;15(1). doi: 10.31426/ijamsr.2021.4.11.4911566662345.
22. Sengupta S. The impact of technology on assessment practices in schools under NEP 2020. *Educ Assess Rev.* 2022;19(1):44-58.
23. Somani G. How NEP 2020 Has Revolutionised The Traditional Examination System? [Internet]. Mastersoft; 2023 Jun 26 [cited 2026 Mar 17]. Available from: <https://www.iitms.co.in/>

Statements and Declarations

Conflict of Interest: The authors have no conflict of interest.

Funding Statement: NA

Declaration of Competing Interest: The authors have no conflict of interest.

Author contributions

Conceptualization: ReechaJrall; **Methodology:** Paramjeet Kour, Ajayshree Singh Sambyal; **Formal analysis and investigation:** ReechaJrall, Paramjeet Kour, Neeru Choudhary, Kuljeet Singh; **Writing - original draft preparation:** Abhimanyu Dev Singh Billawaria, ReechaJrall; **Writing - review and editing:** Abhimanyu Dev Singh Billawaria, ReechaJrall, Paramjeet Kour; **Funding acquisition:** NA; **Resources:** Paramjeet Kour, Ajayshree Singh Sambyal, Vinay Kesar; **Supervision:** ReechaJrall

Data Availability Statement: The authors declare that the data supporting the findings/ conclusions of this study are available within the paper. Any additional data and materials can be obtained from the corresponding author upon reasonable request.

Highlights

- **Technological Framework Analysis:** The study deconstructs the NEP 2020's digital roadmap, emphasizing the roles of the **National Educational Technology Forum (NETF)** and **PARAKH** in creating a unified, tech-driven educational ecosystem.
- **Shift in Pedagogical Roles:** It identifies a critical transformation of teachers from traditional knowledge providers to **content creators and digital facilitators**, utilizing frameworks like **SAMR** and **TPACK** to integrate AI and blended learning effectively.
- **Revolutionized Assessment:** The research highlights the transition from rote-based summative testing to **360-degree holistic evaluations**, supported by the **Academic Bank of Credits (ABC)** and AI-driven data analytics for personalized student tracking.
- **Inclusivity and Future Directions:** By exploring virtual labs and regional language e-content, the paper underscores the policy's focus on bridging the digital divide and ensuring equitable access to high-quality education across diverse socio-economic backgrounds.

Acknowledgement: The authors express their sincere gratitude to the **Cluster University of Jammu** and the **University of Jammu** for providing the academic environment and resources necessary to conduct this research. We are deeply thankful to our colleagues and the School of Teacher Education for their insightful feedback and encouragement throughout the study. We also acknowledge the visionary framework provided by the **Ministry of Education, Government of India**, through the **National Education Policy 2020**, which served as the primary catalyst for this exploration. Finally, we thank the various researchers whose meta-analytical data enriched our findings on technology integration in modern pedagogy.