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Understanding The Techno-Pedagogical Aspects in Light of NEP 2020

Dr. Chiranjit Setua
Assistant Professor, Madhyamgram B.Ed. College, Kolkata
Email: csetua@gmail.com ORCID: 0000-0003-2623-8597

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Abstract

The integration of technology into education has redefined traditional teaching-learning paradigms, especially in the wake of global digitalization and unforeseen disruptions like the COVID-19 pandemic. This conceptual research paper explores the techno-pedagogical aspects emphasized in India's National Education Policy (NEP) 2020, which envisions a digitally empowered, inclusive and learner-centric education system. Techno-pedagogy, which involves the strategic blending of technological tools, resources and devices with pedagogical methods, is presented as a crucial framework for enhancing educational quality, access and equity. This paper examines how NEP 2020 promotes techno-pedagogical integration across various chapters, notably Chapter 23 and Chapter 24, by recommending the use of digital platforms, teacher training, adaptive assessments and inclusive content creation. Additionally, chapters such as 2.8, 5.15, 6.11, 12.2 and 21.9 reinforce the importance of ICT in areas such as reading promotion, inclusive education, professional development and curriculum innovation. The research highlights the policy's focus on developing techno-pedagogical skills among educators through continuous professional development, digital content repositories, virtual labs and blended learning models. By aligning pedagogy with digital proficiency, NEP 2020 aims to prepare teachers and learners for the demands of the 21st-century knowledge economy. This paper contributes to the understanding of techno-pedagogy as both a conceptual and practical framework, providing insights for future research, teacher education and policy formulation in the domain of educational technology.

Keywords: *Techno-Pedagogical Aspects, Techno-Pedagogical Skill, Techno-Pedagogy*

Introduction

The landscape of education has undergone a transformative shift in recent decades, driven by rapid advancements in technology, globalization and changing societal needs. Traditional face-to-face teaching is now being reshaped by digital innovations, with online platforms and tech-integrated methods playing a vital role in modern learning. The widespread availability of the internet, smartphones and interactive tools has expanded access to education, making learning more flexible, personalized and accessible to diverse populations. As a result, learners can now engage in education beyond physical classrooms and traditional schedules, embracing continuous and self-paced learning. The global COVID-19 pandemic further accelerated this shift, compelling educators to adopt virtual teaching strategies and highlighting both the benefits and limitations of remote learning. It also

underscored the importance of equipping students with essential 21st-century skills like critical thinking, collaboration, creativity and digital competence. In this evolving educational landscape, the integration of technology with pedagogy, known as techno-pedagogy, has become vital. It supports dynamic, inclusive and learner-centered approaches to teaching, aligning closely with reformative policies like India's National Education Policy (NEP) 2020 that emphasize digital empowerment and innovative teaching-learning practices.

Hence, the purpose of this conceptual paper is to explore the role and significance of techno-pedagogy as an indispensable approach in implementing the vision of the National Education Policy (NEP) 2020, with a focus on enhancing teaching-learning practices in the digital era. It also serves as a foundation for future research and policy formulation in the field of educational technology and digital pedagogy.

Techno-Pedagogy

In the context of modern education, techno-pedagogy refers to the teacher's ability to integrate digital technologies meaningfully into teaching practices. Bala and Tao (2018) describe it as the proficient use of various technological tools and resources to facilitate inclusive and high-quality educational experiences. Bhuyan and Tripathy (2021) highlight that techno-pedagogy involves the application of ICT in core teaching processes such as lesson design, instructional delivery and assessment, ultimately improving the effectiveness of teaching and learning activities.

Thakur (2015) conceptualizes techno-pedagogy as a hybrid teaching method that enables the strategic and efficient use of ICT to achieve enhanced student learning. According to Paul and Thanakachan (2019), it encompasses the ability to harmonize technology with strong pedagogical techniques to create impactful classroom experiences. Sharma and Sharma (2021) assert that techno-pedagogy equips teachers with the competence to merge technological tools with teaching methodologies, facilitating meaningful knowledge transfer. Thus, it evolves from the integration of content, pedagogy and technology in instructional practice.

Techno-Pedagogical Skill

Techno-pedagogical skill refers to the specific abilities and competencies that enable teachers to effectively blend technology with pedagogical strategies in the teaching-learning process. These skills involve not only the technical know- how to operate digital tools but also the pedagogical understanding to apply them meaningfully within instructional contexts. In essence, techno-pedagogical skills allow educators to use ICT tools in a purposeful and learner-centered manner to enhance the overall quality and accessibility of education.

This skill encompasses various aspects of teaching, including lesson planning, content delivery, classroom interaction, assessment and feedback, all supported by technology. They are rooted in a deep understanding of how content knowledge, pedagogy and technology intersect, a concept reflected in the TPACK framework. A teacher with strong techno-pedagogical skills can create engaging, inclusive and adaptive learning environments that respond to diverse student needs. Such skills are essential in today's digital era, especially as educational policies like NEP 2020 emphasize ICT integration in all aspects of teaching and learning.

Key Provisions of NEP 2020 for Techno-Pedagogical Aspects

The National Education Policy (NEP) 2020, the first education policy of the 21st century, emphasizes not only ***"what students learn in the classroom"*** but also ***"how they learn,"*** highlighting the central role of emerging technologies such as artificial intelligence and various educational tools and platforms. Recognizing India's position as a global leader in the field of Information and Communication Technology, the policy aligns with the vision of Digital India, which aims to transform the country into a ***"digitally empowered society and knowledge economy"*** by promoting a synergistic relationship between education and technology. In this context, NEP 2020 outlines two specific chapters that focus on integrating technology into education:

- ***Chapter 23***, titled *'Technology Use and Integration'*, and

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➲ ***Chapter 24***, titled *'Online and Digital Education Ensuring Equitable Use of Technology'*.

These chapters primarily stress the development of competent techno-pedagogues by enhancing teacher preparation, instructional planning, effective implementation, learner evaluation, and creation of appropriate digital learning resources.

Apart from these two chapters, NEP 2020 also highlighted the important aspects of Techno-Pedagogy across the different chapters. These are mentioned below as per chapter-wise.

In Chapter 2.8

Chapter 2.8 of NEP 2020 highlights the promotion of reading through accessible and inspirational books, including those developed via *technology-assisted high-quality translations* in various Indian languages. This directly connects with the techno-pedagogical approach, as it emphasizes the use of digital tools and platforms- such as *digital libraries*, *e-books* and *virtual book clubs*- to foster reading habits. By integrating ICT in the development, distribution and accessibility of learning resources, teachers can use these tools to design engaging reading activities and promote literacy. This integration enhances instructional strategies, supporting inclusive and equitable learning aligned with techno-pedagogical objectives.

In Chapter 5.15

Chapter 5.15 of NEP 2020 emphasizes *Continuous Professional Development (CPD)* for teachers through diverse modes, especially online platforms, which strongly aligns with the concept of techno-pedagogy. The inclusion of *online teacher training modules*, *virtual workshops* and *digital resource-sharing platforms* empowers educators to stay updated with innovative teaching strategies and technological advancements. This continuous learning model fosters the development of techno-pedagogical skills, enabling teachers to integrate digital tools with modern pedagogical practices such as competency-based learning, adaptive assessments and experiential or arts-integrated learning. The requirement for teachers to complete *at least 50 hours of CPD annually* ensures sustained engagement with technology-enhanced instructional methods. Moreover, online platforms facilitate collaborative learning, where educators can exchange best practices and ideas, further enhancing techno-pedagogical effectiveness. By blending content knowledge, pedagogy and digital proficiency, this initiative helps build a digitally competent teaching force capable of delivering high-quality, engaging and inclusive education in line with 21st-century learning demands.

In Chapter 6.11

Chapter 6.11 of NEP 2020 strongly supports the inclusion of children with disabilities in mainstream education, and this is deeply connected to the techno-pedagogical approach, particularly in the context of *Teaching-Learning Materials (TLMs)* and inclusive instructional practices. The policy emphasizes the use of assistive technologies and technology-based tools, such as *screen readers*, *Braille-enabled devices*, *large-print content* and *audio-visual aids* to accommodate diverse learning needs. These digital tools, when integrated effectively into pedagogy, allow educators to deliver personalized, accessible instruction that aligns with each learner's abilities. The creation and use of *language-appropriate and accessible digital TLMs*, including modules in Indian Sign Language developed by NIOS, ensure meaningful participation of children with disabilities in all classroom activities. By equipping teachers with both technological proficiency and inclusive pedagogical strategies, techno-pedagogy helps foster a barrier-free, supportive learning environment. Thus, it plays a vital role in promoting equity, inclusion and full classroom engagement for all learners, regardless of disability.

In Chapter 12.2

Chapter 12.2 of NEP 2020 emphasizes institutional autonomy in *designing curriculum*, *pedagogy* and *assessment* to foster creativity and student engagement, which aligns closely with the principles of techno-pedagogy. Through the integration of digital tools and platforms, Higher Education Institutions (HEIs) can create flexible, interactive

and learner-centered curricula that support diverse learning styles. The shift towards continuous formative assessment and criterion-based grading can be effectively managed using *technology-enabled evaluation systems*, including learning analytics and adaptive assessment tools. Additionally, in both online and offline modes, digital platforms allow for collaborative learning, multimedia-rich content delivery and personalized instruction. Techno-pedagogical practices thus empower faculty to innovate in pedagogy and implement comprehensive, technology-supported assessments that are aligned with program outcomes, promoting fairness and deeper learning. This integration supports the policy's vision of quality, flexible and engaging higher education.

In Chapter 21.9

Chapter 21.9 of NEP 2020 focuses on enhancing access to books and promoting a culture of reading, especially in underserved and rural areas, which strongly connects with the principles of techno-pedagogy. The recommendation to strengthen and modernize libraries, including *digital and mobile libraries*, emphasizes the *integration of technology into literacy development*. By making library resources available online and accessible in multiple Indian languages, including formats for persons with disabilities, the policy supports inclusive, *technology-driven learning*. Techno-pedagogical tools such as *e-books*, *audio books* and *online reading platforms* can enrich learning experiences and cater to diverse learner needs. Additionally, training and Continuous Professional Development (CPD) for library staff aligns with techno-pedagogical goals of building digital competency. These measures allow educators and institutions to design reading-related instructional strategies that are engaging, equitable and accessible, ultimately enhancing the role of libraries in education through the effective blend of technology and pedagogy.

In Chapter 23

Techno-pedagogy is strongly interwoven with the vision of Chapter 23 of NEP 2020, which promotes the integration of advanced technologies into education to improve access, quality, and innovation.

The policy highlights *India's leadership in ICT* and the transformative power of the *Digital India Campaign*, asserting the *bi-directional relationship between education and technology*. This sets the stage for techno-pedagogical practices, where educators must not only use technology for instruction but adapt their pedagogical approaches to maximize digital potential.

It emphasizes the rapid advancement of disruptive technologies like *AI*, *VR*, *smart boards* and *adaptive assessments*. These innovations redefine how students learn, demanding a pedagogical shift. Teachers equipped with techno-pedagogical skills can harness these tools for personalized, interactive and student-centric learning.

It introduces the *National Educational Technology Forum (NETF)*, a platform to guide technology use in education. NETF's roles- policy advising, capacity building and research- mirror the goals of techno-pedagogy: aligning digital tools with meaningful instruction and systemic reform.

The platforms like *DIKSHA* and *SWAYAM* reflect the techno-pedagogical model by offering *multilingual e-content* and *professional development modules*. These empower teachers to integrate technology into their practice, ensuring inclusive and equitable education.

It discusses the need for Higher Education Institutions (HEIs) to create content, deliver blended courses and train students for AI-driven job markets. This requires educators to apply techno-pedagogy in curriculum design, content development and skill-based instruction.

Finally, the policy encourages ethical awareness, data privacy education and *inclusive digital engagement* through structured curriculum and continuing education. Techno-pedagogical competence becomes essential for preparing both educators and learners to navigate and contribute responsibly in a tech-driven society, fulfilling NEP's long-term vision.

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In Chapter 24

Techno-pedagogy is deeply embedded in Chapter 24 of NEP 2020, which addresses the challenges and possibilities of online and digital education. The chapter underscores how technology must be integrated with pedagogy to ensure inclusive, engaging and effective learning for all, especially in response to emergencies like pandemics.

In 24.1, the policy acknowledges the new educational realities brought on by health crises and emphasizes the *use of technology to maintain learning continuity*. This reinforces techno-pedagogy's role in offering alternative, flexible modes of instruction that *blend pedagogy with technology to create meaningful learning experiences* even beyond traditional classrooms.

24.2 highlights the need to *eliminate the digital divide* to make online education equitable. Techno-pedagogy here involves *designing inclusive digital resources* and *teaching strategies* that consider access disparities, thereby ensuring no learner is left behind due to technological limitations.

24.3 focuses on teacher readiness, stating that effective online education demands new pedagogical skills. This aligns with the techno-pedagogical approach, where teachers are trained not just in content delivery but also in *using digital tools*, *adapting instructional methods* and *designing suitable online assessments* that promote active learning and integrity.

24.4 lays out a comprehensive roadmap through ten sub-points, directly supporting techno-pedagogy-

a. Pilot studies explore optimal blends of technology and pedagogy
b. Building scalable digital infrastructure reflects the foundational support techno-pedagogy requires
c. Platforms like DIKSHA and SWAYAM provide assistive teaching tools, promoting technology-supported instructional design
d. Creation of gamified, AR/VR content and multilingual repositories illustrates how technology enhances pedagogy through engagement and accessibility
e. Using television/radio for content delivery shows how techno-pedagogy addresses equity in low-connectivity areas
f. Virtual labs offer hands-on learning, integrating experimentation with digital tools
g. Teacher training and incentives promote development of digital instructional expertise
h. Technology-based assessment systems align with 21st-century skills and feedback mechanisms
i. Blended learning models fuse online and face-to-face approaches, a core aspect of techno-pedagogy
j. Standardization ensures pedagogical quality across digital platforms

24.5 proposes a dedicated unit to oversee *digital infrastructure*, *content* and *capacity building*- ensuring techno-pedagogical integration is systematically developed, implemented and refined to address India's scale and diversity through expert collaboration and innovation.

Techno-Pedagogical Aspects in Light of NEP 2020: A Brief Overview

The National Education Policy (NEP) 2020 emphasizes a transformative educational model that integrates technology with pedagogy to promote inclusive, effective and future-ready learning. Rooted in the vision of a digitally empowered India, the policy highlights multiple techno-pedagogical provisions across its chapters to enhance teacher competence, digital infrastructure, learner engagement and equitable access through innovative instructional approaches. Here, the aspects are mentioned below.

- Promotes digital tools like e-books, virtual libraries and reading apps to foster inclusive literacy development.
- Encourages ICT-supported translations and access to reading materials in multiple languages.
- Emphasizes Continuous Professional Development (CPD) through online platforms and modules.

- Encourages teachers to adopt modern pedagogies like adaptive assessments and arts-integrated learning using technology.
- Recommends use of assistive technologies (screen readers, Braille tools, AV aids) for inclusive education.
- Advocates for digital, accessible Teaching-Learning Materials (TLMs) for children with disabilities.
- Promotes institutional autonomy in curriculum and assessment using digital platforms.
- Encourages HEIs to use learning analytics, multimedia content and formative assessments.
- Proposes modernization of libraries into digital/mobile formats.
- Recommends training for library staff in techno-pedagogical skills to ensure equitable access to resources.
- Advocates for advanced technologies (AI, VR, smart boards) in classrooms.
- Establishes the National Educational Technology Forum (NETF) for policy guidance and capacity building.
- Promotes platforms like DIKSHA and SWAYAM for multilingual content and teacher development.
- Emphasizes ethical, inclusive digital education and preparation for tech-driven job markets.
- Addresses continuity in learning during emergencies via flexible tech-based instruction.
- Stresses eliminating the digital divide with inclusive resources and equitable access.
- Identifies teacher readiness for online pedagogy and technology-integrated assessments.
- Lays out a 10-point action plan (e.g., pilot studies, gamified content, AR/VR tools, blended models).
- Proposes a dedicated digital education unit to oversee infrastructure, content and innovation.

These provisions collectively underscore NEP 2020's strong commitment to developing a robust, digitally proficient educational ecosystem through effective techno-pedagogical integration.

Conclusion

The National Education Policy (NEP) 2020 marks a transformative step toward integrating technology with pedagogy to create a more inclusive, equitable and effective education system. By embedding techno-pedagogical principles across multiple chapters, NEP 2020 reimagines the teaching-learning process through digital empowerment, inclusive access, and continuous teacher development. Chapter 23 and Chapter 24 serve as the cornerstone for this transformation, highlighting how advanced technologies like AI, AR/VR, digital platforms and virtual labs can redefine education across school and higher education. Simultaneously, earlier chapters, such as 2.8, 5.15, 6.11, 12.2 and 21.9, reflect the deep-rooted need to align technological tools with pedagogical strategies that cater to diverse learners, including those with disabilities and from underserved communities.

The policy rightly emphasizes the preparation of educators through CPD, online training modules and collaboration platforms like DIKSHA and SWAYAM, ensuring they are equipped with the necessary digital and pedagogical skills. Furthermore, initiatives such as building digital infrastructure, enhancing content accessibility and standardizing online learning practices demonstrate a strategic approach to scaling techno-pedagogical integration.

In essence, NEP 2020 envisions a forward-looking educational ecosystem where technology and pedagogy work hand-in-hand to nurture creativity, critical thinking and inclusivity. It lays the foundation for developing globally competent learners and educators, fully prepared to meet the challenges and opportunities of the 21st-century digital age.

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