

Digital Pedagogical Opportunities in Higher Education under National Education Policy 2020

Gunjan Mathur¹ and Bhagwati P. Pande^{2,*}

¹ Department of Computer Applications, Government PG College, Gopeshwar, Chamoli, Uttarakhand, India

² Department of Computer Science, Soban Singh Jeena University, LSM Campus, Pithoragarh, Uttarakhand, India

Email: gunjan.m19@gmail.com (G.M.); bhagwatipande@ssju.ac.in (B.P.P.)

*Corresponding author

Manuscript received June 3, 2026; accepted September 8, 2026; published October 16, 2026

Abstract—India's *National Education Policy (NEP) 2020* envisions a comprehensive transformation of the educational landscape, thereby emphasizing integration of digital technologies into higher education. While individual studies have examined specific digital tools or pandemic-driven pedagogical responses, a consolidated analysis that systematically maps NEP 2020's provisions for digital education into the available technological resources remains limited. The present study addresses this gap through a structured narrative review of 48 secondary literary sources, including scholarly articles, policy documents, and institutional reports, to analyse the opportunities and challenges associated with digital pedagogy in Indian higher education under NEP 2020. The study contributes to the literature in two ways: first, it provides a systematic mapping from NEP 2020's specific policy provisions and the existing digital platforms to implement them, and second, it critically identifies the structural gaps between policy intent and ground-level adoption. The analysis reveals that digital platforms such as SWAYAM, NPTEL, MOOCs, and various learning management systems offer substantial support for realising NEP 2020's objectives, including interdisciplinary education, flexible learning pathways, and competency-based assessment. However, persistent challenges, including the digital divide, inadequate training for faculty members, infrastructural limitations, and concerns about academic integrity, hinder its effective implementation. The findings underscore the need for adequate investments in digital infrastructure, systematic faculty development programmes, and inclusive policy frameworks to fully realise the transformative potential of NEP 2020's digital education agenda.

Keywords—blended learning, digital pedagogies, narrative review, NEP 2020, online courses, open distance learning

I. INTRODUCTION

"Education for All" has long been an integral component of the sustainable development agenda, irrespective of the mode of delivery. In India, conventional classroom instruction had been the most popular method of teaching before 2020 [1]. The onset of the COVID-19 pandemic compelled educational institutions worldwide, including those in India, to switch rapidly towards digital and online alternatives. According to Wang *et al.* [2], 126 out of 195 countries incorporated e-learning platforms during the pandemic period. This unprecedented shift not only disrupted traditional pedagogical practices but also revealed both the potential and the limitations of technology-mediated education. E-learning methods that address the needs of contemporary learners in an increasingly technology-driven environment have since been recognised as an essential pedagogical approach [3]. Although digital education has been proven effective in maintaining educational continuity

during the pandemic, it brought significant challenges, including resistance to change among educators, resource constraints, and insufficient institutional support [4].

Against this backdrop, India's *NEP 2020* emerged as a landmark reform document, the first comprehensive education policy in three decades. The policy advocates for a fundamental paradigm shift, promoting interdisciplinary and holistic education that integrates traditional academic learning with skill development, vocational training, and an emphasis on local contexts and languages [5]. Key provisions include the establishment of a *National Educational Technology Forum (NETF)* to leverage technology for enhanced teaching, learning, and assessment; the introduction of the *Academic Bank of Credits (ABC)* for flexible credit accumulation and transfer; and the promotion of blended learning through platforms such as SWAYAM and NPTEL. The policy also emphasises competency-based assessment, multilingual education, and the progressive integration of vocational education from the secondary stage onwards [5].

While a growing body of literature has examined individual aspects of digital education, such as the adoption of MOOCs [6], student engagement in online settings [7], and the impact of specific e-learning tools [8], only a few studies have undertaken a comprehensive analysis that systematically maps NEP 2020's digital education provisions to available technological resources, while critically evaluating both opportunities and implementation challenges. The present study addresses this gap by addressing three objectives: (a) to examine the shift from traditional to digital teaching-learning practices in Indian higher education; (b) to identify and analyse digital platforms and tools available to support NEP 2020's educational objectives; and (c) to critically evaluate the opportunities and challenges of digital education under the framework of NEP 2020.

II. LITERATURE REVIEW

Scholarship on digital education and technology-mediated pedagogy has been grown substantially over the past two decades, accelerating sharply in response to the COVID-19 pandemic and subsequent policy reforms such as NEP 2020 [5, 9]. A comprehensive understanding of the opportunities and challenges facing Indian higher education under this policy framework requires engagement with five intersecting bodies of literature: the global transition to technology-mediated instruction, the pedagogical effectiveness of specific e-learning tools, the Indian policy context shaped by NEP 2020, the structural barriers that

constrain implementation, and the emerging influence of generative artificial intelligence on higher education. Together, these themes establish the conceptual and empirical foundation for the analysis presented in section IV.

A. The Global Shift towards Digital Education

A fundamental shift from traditional to technology-mediated instruction has defined the twenty-first-century educational landscape, a transformation dramatically accelerated by the COVID-19 pandemic. During the post-pandemic era, academia experienced a significant expansion in online pedagogy, with teaching-learning practices increasingly shaped by courses offered through platforms such as edX, Coursera, SWAYAM, and various MOOCs [9]. Across 126 countries, e-learning platforms were adopted during the pandemic, fundamentally influencing pedagogical techniques, lifelong learning, and self-directed study [2]. Student preferences also shifted markedly: all international students expressed an inclination toward e-learning, compared with 81% of Indian students, a preference that persisted into the post-pandemic era [10]. These findings illustrate both the scale of the global shift towards technology-mediated education and the role of contextual factors in shaping adoption patterns. However, the effectiveness of online learning has not been universally established. Early proponents highlighted benefits such as flexibility, cost-efficiency, and favourable comparisons with traditional instructor-led training [11]. In contrast, subsequent research identified substantial challenges in implementing personalised digital learning approaches, including resistance to change, resource constraints, and insufficient teacher support [4]. This tension between the promise of technology-mediated education and the practical difficulties of implementation underscores the need for context-sensitive approaches for technology integration.

B. E-learning Tools and their Pedagogical Effectiveness

Empirical research across multiple contexts has examined which digital tools most effectively support learning. Among these, discussion forums emerged as particularly effective in meeting the diverse needs of learners, outperforming electronic quizzes and assignment platforms in fostering analytical skills [8]. In the Ukrainian education system, simulation software, virtual and augmented reality, customised platforms, and gamification proved most effective for practically oriented subjects [12]. Notably, these technologies were most successfully implemented by younger teachers with one to ten years of experience, suggesting that generational familiarity with technology may influence pedagogical adoption.

Language education further illustrates the diversity of digital tools in use. During the pandemic, instructors of 'English as a Foreign Language' relied on a range of online tools, though the experience underscored the critical need for technical support and systematic training [13]. Among synchronous platforms, Google Meet became one of the most widely adopted videoconferencing tools globally [14]. In India specifically, the growth of educational technology companies such as *BYJU'S* and *Vedantu* has been credited with advancing both educational outcomes and economic development [15]. Collectively, these findings indicate that while effective digital tools are abundant, their successful

deployment depends on teacher training, institutional support, and robust technological infrastructure.

C. NEP 2020 and Indian Digital Education Policy

Within the specific context of NEP 2020, several studies have examined how the policy's digital provisions translate into practice. Curriculum and pedagogy reform initiatives under the policy promote experiential learning, collaborative projects, and technology-enhanced interactive learning environments [16]. Notably, the framework creates a platform for free online courses supported by multiple portals, representing a significant commitment to democratizing access. Research on MOOC adoption has highlighted both the potential and the challenges Indian educators face when integrating these courses into blended learning strategies [6].

Research on digital/online education during the pandemic era within the NEP 2020 framework has recommended that teachers must be trained to create diverse e-content using various software tools [17]. Similarly, an evaluation of a professional development program offered by the *Indira Gandhi National Open University (IGNOU)* found that integrating *Information and Communication Technology (ICT)* tools in academia effectively developed appropriate knowledge and skills among faculty trainees [18]. Despite these encouraging findings, the existing studies largely focus on individual initiatives or tools, and a systematic analysis connecting NEP 2020's comprehensive provisions with the broader technological ecosystem remains limited.

D. Challenges and Barriers to Digital Education

Persistent challenges in implementing technology-mediated education have been extensively documented in the literature. Lack of expertise or experience with e-learning techniques stands out as the most prominent obstacle for both teachers and students [3]. Through the lens of transactional distance theory, research on student engagement has shown that participation can be enhanced by developing specific digital skills, such as online communication [7]. Moreover, several factors affecting students' attentive competence in digital learning environments were identified during the pandemic period.

Teacher preparedness has emerged as a recurring concern across the literature. A two-year longitudinal study demonstrated that continuing professional development programs significantly enhanced self-efficacy among in-service teachers, though the authors emphasised the need for international expansion of such initiatives [19]. Compounding this challenge, teachers from earlier generations have not received adequate exposure to new technologies, nor do they receive timely technical support [16]. This structural gap in faculty development must be addressed for effective implementation of the policy's digital provisions. Furthermore, broader infrastructural limitations, including inequitable access to reliable Internet connectivity and digital devices, particularly in rural India, exacerbate these difficulties [20]. More recently, the arrival of generative AI tools has added a new dimension to concerns about academic integrity and assessment design in digital learning environments [21].

E. Generative AI and the Emerging Frontier of Digital Pedagogy

A more recent development that has reshaped the digital

education landscape is the emergence of Generative Artificial Intelligence (GenAI) tools, particularly Large Language Models (LLMs) such as ChatGPT, which entered mainstream educational use starting in late 2022. Kasneci *et al.* [22] argued that LLMs present significant opportunities for personalised learning, automated feedback, and content generation, while simultaneously raising concerns about accuracy, bias, and over-reliance. In the higher education context, Chan [23] proposed a comprehensive AI policy framework for university teaching and learning, emphasizing that institutional responses must balance pedagogical innovation with academic integrity, assessment redesign, and staff capacity building. A Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis of ChatGPT in education, carried out by Farrokhnia *et al.* [24], further identified opportunities, such as improved accessibility and personalised tutoring, balanced against threats including plagiarism, misinformation, and the risk of undermining higher-order thinking skills. Rudolph *et al.* [21] observed that the arrival of GenAI has intensified longstanding debates about the validity of traditional assessment formats, particularly in online and remote settings where supervision is limited. Although NEP 2020 predates the mainstream adoption of GenAI, its emphasis on competency-based assessment, critical thinking, and technology integration provides a policy foundation upon which Indian higher education institutions may respond to these emerging tools. However, the literature specific to GenAI adoption in Indian higher education under the NEP 2020 framework remains at an early stage of development, indicating a further gap that warrants future empirical enquiry.

III. MATERIALS AND METHODS

This study adopts a structured review approach based on secondary data analysis. Following established guidance on literature-review methodology [25], a narrative review is appropriate for the present study because the sources under consideration are heterogeneous, spanning policy documents, empirical studies, and institutional reports, and the objective is to build an interpretive synthesis rather than to pool quantitative effects. The review draws upon scholarly articles, conference proceedings, policy documents, and institutional reports on digital education, e-learning technologies, and NEP 2020. Sources are identified through three electronic databases, Scopus, Google Scholar, and Web of Science, by employing search terms like ‘NEP 2020’, ‘digital education India’, ‘e-learning in higher education’, ‘online pedagogy’, ‘blended learning’, and ‘MOOC adoption’, etc. The review encompasses publications from 2002 to 2024, with particular emphasis on studies published during and after the COVID-19 pandemic (2020 onwards), given the accelerated adoption of digital education during this period. A small number of seminal works published before 2020 are also included to provide foundational context on e-learning, classroom management, and academic integrity.

The inclusion criteria comprise the following: (a) peer-reviewed articles and conference papers addressing digital or online education; (b) studies with relevance to Indian higher education or NEP 2020; and (c) publications in English. Exclusion criteria include the following: (a) sources that do not pertain to higher education; (b) sources that lack

empirical or analytical substance, such as opinion pieces without argument development; and (c) duplicate publications. The initial database search returned 320 records. After removing duplicates, 280 records were screened based on title and abstract relevance, and 92 records were retained for full-text assessment. Out of these, 48 sources met all inclusion criteria and are included in the final analysis, comprising scholarly articles, conference proceedings, policy documents, and institutional reports. Quality is assessed by verifying that peer-reviewed sources are published in indexed journals and policy documents originate from official government or intergovernmental bodies. The screening sequence is summarised in Fig. 1.

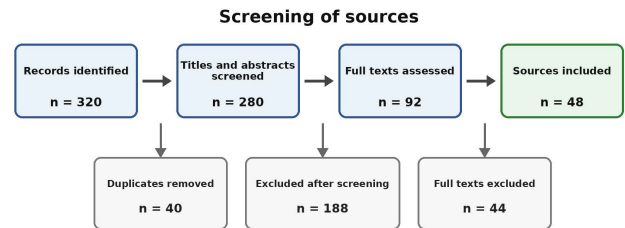


Fig. 1. Simplified PRISMA-style flow diagram of the source-screening process.

Analytically, the review involves thematic categorisation of the literature into five clusters, corresponding to the literature review structure, followed by a systematic mapping of NEP 2020’s key provisions against available technological tools and platforms. Opportunities and challenges are then synthesised through comparative analysis across the reviewed sources.

IV. ANALYSIS: DIGITAL EDUCATION OPPORTUNITIES AND CHALLENGES UNDER NEP 2020

Building upon the thematic analysis of the literature, this section presents a systematic examination of how these findings map onto the NEP 2020 framework. Specifically, the analysis connects the policy’s key provisions to available digital tools and platforms, evaluates opportunities for faculty and students, and identifies persistent implementation challenges.

A. NEP 2020 and the Contemporary Indian Education Landscape

Replacing the previous *National Policy on Education* of 1986, NEP 2020 outlines a comprehensive framework, spanning elementary education through higher education, including vocational training in both urban and rural contexts. Its fundamental principles include interdisciplinary and holistic education encompassing humanities, arts, sciences, and sports; a shift from summative to formative and competency-based assessment that evaluates critical thinking, analytical ability, and conceptual clarity; and flexible undergraduate pedagogy with multiple entry and exit options [5]. To realise these goals, the policy advocates extensive use of digital technologies to enhance teaching-learning practices, mitigate language barriers, expand knowledge access for disadvantaged groups, and streamline educational administration.

Among the most significant innovations introduced is the *Academic Bank of Credits (ABC)*, which enables digital recording and transfer of academic credits across institutions

of higher learning, thereby facilitating flexible and multidisciplinary learning pathways. Additionally, NEP 2020 envisions integrating vocational education with conventional education progressively, targeting that at least fifty per cent of learners have exposure to vocational education by 2025 [5]. As Mondal *et al.* [16] noted, the framework creates a platform for free online courses backed by multiple portals and advocates repositioning from summative assessment to a more comprehensive, formative evaluation system.

B. Digital Tools Supporting NEP 2020 Dimensions

Table 1 presents the five primary dimensions of NEP 2020 and the corresponding digital resources that support their implementation.

Table 1. Digital tools for facilitating teaching and learning under NEP 2020

S.No.	Dimension of NEP 2020	Available Online Tools
1	Inclusive and equitable education	Online learning platforms (SWAYAM, e-Pathshala, Khan Academy); Accessibility tools (text-to-speech software, screen readers)
2	Quality and accountability	Learning management systems (Moodle, Google Classroom); Teacher training platforms (Coursera, edX)
3	Curriculum and pedagogy	Online resources (Khan Academy, Crash Course, TED Talks); Gamification tools (Duolingo, Kahoot)
4	Technology integration	Virtual labs and simulations (PhET Interactive Simulations); Online collaboration tools (Google Docs, Trello)
5	Research and innovation	Online research databases (JSTOR, Google Scholar); Innovation platforms (GitHub, Scratch)

C. Opportunities for Faculty Members and Students

NEP 2020's emphasis on digital education presents substantial opportunities for both faculty members and students in Indian higher education. The policy's provision for education in the mother tongue, combined with the availability of digital resources in multiple languages, has the potential to extend access to a wider range of learners across India [5]. Digital platforms enable faculty to access and share diverse educational resources, including videos, interactive simulations, and scholarly articles, thereby enhancing the quality and variety of instructional content [26]. The flexibility afforded by online teaching allows educators to manage their schedules more effectively while accommodating the diverse needs of their students [1].

Professional development represents another significant opportunity. Faculty members can engage in online training programs and collaborate with peers globally, fostering an international exchange of pedagogical strategies [27]. Baghel [18] demonstrated that short-term professional development programs effectively enhanced faculty expertise in digital pedagogy, suggesting that targeted training initiatives can bridge the skills gap. Moreover, digital technologies encourage the adoption of innovative teaching methods, including flipped classrooms, gamification, and personalised learning pathways [20]. MOOCs can further enhance conventionally taught courses and serve as supplementary resources to help teachers and students achieve their objectives [6].

For students, digital tools and platforms enhance engagement through interactive activities, instant feedback,

and multimedia content [28]. Online platforms frequently provide analytical insights into student performance, enabling educators to tailor instruction and provide targeted support [29]. The scalability of digital education enables institutions to reach larger and more geographically diverse audiences, thereby expanding educational opportunities beyond traditional boundaries [27]. Digital platforms also facilitate enhanced communication and collaboration among students and between students and faculty through discussion forums, group projects, and peer reviews [30]. Wang *et al.* [2] further noted that in contrast to traditional classroom education, e-learning offers advantages such as flexible scheduling, content reusability, ease of maintenance, lower costs, and automated assessment capabilities.

Beyond flexibility and engagement, online learning environments also support inclusive education by accommodating diverse learning needs, including those of students with disabilities, through accessibility tools such as text-to-speech software and screen readers [31]. Discussion forums have proved particularly effective in addressing the diverse needs of students with varying levels of comprehension and cognitive ability, enabling teachers to reach learners who progress at their own pace [8].

D. Challenges in Implementation

Despite the substantial opportunities, the implementation of digital education under NEP 2020 faces considerable challenges that must be addressed systematically. Technological barriers constitute a primary obstacle, as many educators and students lack access to reliable Internet connections and adequate hardware, hindering the seamless conduct of online classes [20]. This challenge is particularly acute in rural areas and among economically disadvantaged populations, creating a significant digital divide that risks exacerbating existing educational inequities [32].

Insufficient training and professional development in digital tools and online teaching methodologies remain a critical concern. Maatuk *et al.* [3] identified lack of expertise as the most prominent barrier to effective digital education, while Mondal *et al.* [16] observed that teachers from earlier generations have received inadequate exposure to contemporary technologies. The assumption that effective traditional classroom instruction translates directly to proficiency in online teaching has been challenged; Baghel [18] emphasised that separate and targeted training is necessary for the online environment. Ensuring meaningful student interaction and participation in online settings poses additional difficulties due to the absence of physical presence and direct interpersonal contact. Sustaining students' motivation and self-discipline is more challenging in digital environments where distractions are abundant, and teacher supervision is limited [1]. Furthermore, the blurred boundaries between professional and personal spaces can lead to burnout and stress among faculty, adversely affecting well-being and productivity [33].

Assessment in the digital environment poses some specific challenges. Conducting fair and effective online evaluations requires addressing concerns about academic integrity, as direct supervision is not feasible during remote assessments [34, 35]. Naim [8] noted that large-scale online examination administration faces multiple obstacles,

including limitations on question types, power and network outages, and difficulties in preventing unethical conduct. Adapting curricula for online delivery while maintaining equivalent quality and learning outcomes to those of traditional classrooms has also proven to be a significant undertaking [36]. Creating inclusive digital learning environments that serve all students, including those with disabilities and from diverse backgrounds, requires deliberate effort in the design and implementation of online educational resources [37].

E. NEP 2020 Principles and Corresponding Digital Tools

Table 2 presents a detailed mapping of specific NEP 2020 principles to available digital tools, along with supporting references from the literature.

Table 2. Digital tools for facilitating teaching and learning under NEP 2020

S. No.	Principle of NEP 2020	Digital Tool(s)	Reference
1	Identifying and promoting the unique potential of each student	SafeAssign (Blackboard)	[24]
2	Academic Bank of Credits for credit transfer	ABC Portal, DigiLocker	[5]
3	Research and innovation in UG programmes	JSTOR, Google Scholar, GitHub, Scratch	[38]
4	Mentorship programmes for students	Slack, Discord	[39]
5	Flexibility according to learner skills and interests	Moodle LMS	[38]
6	No strict disciplinary boundaries; multidisciplinary education	SWAYAM, MOOCs, online minor courses	[40]
7	Skill development and vocational integration	BYJU'S, Coursera, Simplilearn, upGrad	[40]
8	Interdisciplinary education across arts, sciences, and humanities	SWAYAM, MOOCs	[40, 41]
9	Conceptual understanding over rote learning	Virtual Labs (IIT Delhi)	[16]
10	Regular formative assessment	Google Forms, Quizlet	[13]
11	Multilingual education and local language support	Spoken Tutorial (IIT Bombay)	[42]
12	Formative over summative assessment emphasis	Moodle, IITBombayX	[38]
13	Diversity and local context in pedagogy	Zoom, Google Meet, WebEx	[43]
14	Equity and inclusion in academic decisions	SWAYAM, e-Pathshala, Khan Academy	[44, 45]
15	Curricular continuity from school to higher education	BYJU'S, Vedantu	[15]
16	Quality education and teacher training	Moodle, Google Classroom, Coursera, edX	[18]
17	Professional development for university faculty	SWAYAM, DIKSHA	[18]
18	Technology integration for enhanced learning	IIT-D Virtual Labs, PhET, Google Docs, Trello	[12]

As this detailed mapping reveals, digital tools do exist to support virtually every core principle outlined in the national education framework: from personalised assessment and flexible credit systems to interdisciplinary education and teacher development. Yet availability alone does not guarantee effective implementation; success depends on institutional capacity, faculty readiness, student access, and sustained policy support.

V. DISCUSSIONS

Synthesising the findings of the present review reveals a complex landscape of opportunities and challenges for technology-mediated education within the NEP 2020 framework. A substantial ecosystem of digital tools and platforms, including learning management systems, MOOCs, videoconferencing platforms, virtual laboratories, and e-learning portals, supports the realisation of the policy's educational objectives. As Table 1 and Table 2 illustrate, each major principle can be matched to existing digital infrastructure, suggesting that the technological foundations for the implementation of NEP 2020 exist in place.

However, the present work also reveals a significant gap between the availability of digital tools and their effective adoption. While NEP 2020 envisions comprehensive technology integration, the literature consistently identifies structural barriers that impede implementation. The most prominent factor among these is the digital divide, which encompasses disparities in Internet access, hardware availability, and digital literacy across geographic and socioeconomic contexts [20, 32]. This divide is particularly pronounced in rural India, where infrastructure limitations pose fundamental obstacles to the digital transformation envisioned by the policy. The finding that 81% of Indian students express an inclination toward e-learning, compared to the higher rates among international students, as reported by Radha *et al.* [10], may partly reflect these infrastructural constraints.

Faculty preparedness emerges as another critical determinant of successful implementation. The literature reveals a tension between the policy's ambitious digital education goals and the current state of teacher training. While targeted professional development programs have demonstrated effectiveness [18, 19], the scale of training required to equip the majority of Indian higher education faculty with adequate digital pedagogical skills remains a formidable challenge, particularly for educators with limited prior exposure to technology [3, 16]. The finding mentioned by Koreneva *et al.* [12], that younger teachers more successfully implemented innovative technologies, highlights a generational dimension to this challenge that warrants targeted intervention.

An important distinction also emerges between emergency remote teaching, which characterised much of the pandemic response, and the planned integration of online pedagogy that NEP 2020 envisions [36]. Lessons from this pandemic period provide a valuable foundation for the more systematic approach to technology-enhanced education that the policy advocates. Translating emergency adaptations into sustainable, high-quality learning practices that align with the framework's broader educational objectives remains the central implementation challenge.

A. International Comparisons and Policy Implications

The opportunities and challenges identified in Section IV above do not exist in isolation; several countries and international bodies have faced comparable tensions between aspirations for digital education and its implementation, and their experiences offer instructive parallels for the Indian context. Situating NEP 2020's digital education provisions within the broader international landscape offers valuable

comparative insights. The European Union's (EU) *Digital Education Action Plan* (2021–2027) establishes common standards for high-quality, inclusive, and accessible digital education across all member states, promoting supranational harmonisation of digital competence frameworks [46]. Unlike this coordinated multi-country approach, NEP 2020 operates within a single national context that is nonetheless marked by considerable federal diversity in educational governance and infrastructure. The EU experience suggests that standardised digital competence frameworks, which NEP 2020 currently lacks, could provide a more structured pathway for measuring and improving digital readiness across Indian states and institutions. A comprehensive review by Timotheou *et al.* [38], supported by the EU Joint Research Centre, identified institutional leadership, digital competence of faculty members, infrastructure, and pedagogical integration as the key factors influencing schools' digital capacity and transformation. This multi-dimensional framework raises the question of whether NEP 2020's digital provisions adequately address all these dimensions or focus predominantly on content delivery platforms such as SWAYAM and DIKSHA. This concern directly echoes the faculty-preparedness and infrastructural challenges identified in section IV-D and Table 2, suggesting that the Indian framework may benefit from an EU-style competence taxonomy to complement its existing platform ecosystem.

China's approach offers a particularly instructive contrast. Over the past two decades (1999–2022), the country's online education policy evolved through four developmental stages: pilot exploration, standard development, transformation, and governance improvement [47]. By building digital infrastructure and governance capacity incrementally before expanding access universally, the *Education Informatisation 2.0 Action Plan* adopted a phased strategy. NEP 2020, by comparison, attempts to address infrastructure development, governance reform, and universal access simultaneously, an ambitious approach that may benefit from these phased implementation lessons. The Chinese phased model is particularly relevant to the digital divide concerns raised in section IV-D, where the simultaneous pursuit of urban and rural digital transformation risks widening rather than narrowing existing gaps. In a complementary finding, a comparative study across seven countries, including Australia, India, Ireland, Italy, Japan, Canada, and Sri Lanka, revealed significant misalignment between macro-level policies and the micro-level realities of schooling systems [48]. Thus, a gap between policy aspiration and ground-level implementation is not unique to India, but it represents a global challenge.

Beyond policy design, the digital divide remains a global concern with particular severity in developing nations. An analysis of digital inequalities across five South Asian countries, including India, revealed that structural barriers related to rural connectivity, gender gaps, and socioeconomic disparities remained largely unaddressed by national policies during the pandemic [49]. Data from 45 countries similarly showed that while school-level digital readiness was not systematically linked to socioeconomic composition, student-level digital skills varied substantially by social class and gender [50]. This finding suggests that NEP 2020's focus on institutional-level infrastructure provision may be

insufficient without complementary interventions addressing household-level disparities in access and competence. Financial sustainability raises further concerns: the UNESCO Global Education Monitoring Report [45] cautioned that achieving basic digital learning connectivity in lower-middle-income countries would add 50% to existing financing gaps for the targets of the *Sustainable Development Goal*. Finally, a comparative analysis of the approaches of the African Union, EU, Organisation for Economic Co-operation and Development (OECD), and UNESCO found significant variation in how these organisations frame the divide; the OECD emphasises skills and competency frameworks, while UNESCO prioritises equity and access [44]. This tension between excellence and inclusion is also visible within NEP 2020's own dual goals. Taken together, these international comparisons reinforce three implications for the Indian context: first, that platform provision alone is insufficient without complementary competence frameworks; second, that phased implementation may be more effective than simultaneous multi-dimensional rollout; and third, that household-level and gender-level access disparities require targeted policy attention beyond institutional infrastructure investment.

B. Digital Tools Supporting NEP 2020 Dimensions

The present study has several limitations that should be acknowledged. First, the choice of a structured narrative review, rather than a fully systematic review following PRISMA protocols, was made to accommodate the heterogeneous nature of the sources and to enable interpretive synthesis; while this approach supports thematic breadth, it does not offer the replicability and pooled quantification that systematic reviews or meta-analyses afford. Second, because the review relies on secondary data and existing literature, the findings are constrained by the scope and quality of the reviewed sources. Primary empirical data, such as surveys or interviews with faculty and students, would provide more direct evidence of implementation challenges and opportunities. Third, the review predominantly draws upon studies published during and immediately after the COVID-19 pandemic, a period characterised by emergency responses that may not reflect steady-state conditions for digital education. Fourth, the analysis does not differentiate between the diverse institutional contexts within Indian higher education, including variations between central, state, and private universities, or between urban and rural settings. These contextual differences likely influence both the opportunities and challenges associated with digital education implementation.

VI. CONCLUSIONS

Through a narrative review of secondary sources, this study examined the opportunities and challenges of technology-mediated pedagogy in Indian higher education under NEP 2020. The analysis reveals that the policy provides a progressive framework for integrating digital technologies, with provisions spanning interdisciplinary education, flexible learning pathways, competency-based assessment, multilingual education, and vocational training. A diverse ecosystem of digital tools (including SWAYAM,

NPTEL, MOOCs, learning management systems, and virtual laboratories) supports these objectives, and the systematic mapping of policy provisions to technological resources demonstrates a broad alignment between the framework's vision and existing digital infrastructure.

However, the successful implementation of NEP 2020's digital education agenda is contingent upon addressing persistent challenges, including the digital divide, inadequate faculty training, infrastructural limitations, and concerns regarding academic integrity in online assessment. The findings suggest that a multi-pronged approach is necessary, encompassing targeted investments in digital infrastructure to bridge the access gap, systematic and sustained professional development programs for faculty, the development of robust strategies for online assessment, and the creation of inclusive digital learning environments that accommodate the diverse needs of all learners.

Future research should pursue empirical investigations to complement the present review's findings. Longitudinal studies tracking the implementation outcomes of NEP 2020's digital education provisions across diverse institutional contexts would yield valuable insights. Since the misalignment between macro-level policies and ground-level realities warrants context-specific empirical investigation, comparative studies examining digital education policies across countries, drawing on contemporary frameworks, could inform more effective implementation strategies for the Indian context. Additionally, primary data collection through surveys and interviews with faculty and students would provide direct evidence of the opportunities and barriers experienced in practice.

Realising this transformative vision for technology-mediated education requires concerted and coordinated efforts among policymakers, educational institutions, faculty, and technology providers. By addressing the identified challenges and leveraging the available opportunities, India can progress toward an equitable, high-quality, and future-ready education system that empowers all learners.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

The first author, Ms. Gunjan Mathur, carried out the preliminary study, performed the literature study, compared literary articles, and wrote the initial draft of the manuscript. The second and corresponding author, Dr. Bhagwati Prasad Pande, mentored the project, presented insights for the literature analysis, appended the literature review, and wrote the final draft of the manuscript. Both authors approved the final version.

REFERENCES

- [1] W. Bao, "COVID-19 and online teaching in higher education: A case study of Peking University," *Human Behavior and Emerging Technologies*, vol. 2, no. 2, pp. 113–115, 2020. doi: 10.1002/hbe2.191
- [2] X. Wang, W. Chen, H. Qiu *et al.*, "A survey on the e-learning platforms used during COVID-19," in *Proc. 2020 11th IEEE Annual Information Technology, Electronics and Mobile Communication Conference (IEMCON)*, Vancouver, BC, Canada, 2020, pp. 0808–0814. doi: 10.1109/IEMCON51383.2020.9284840
- [3] M. Maatuk, E. K. Elberkawi, S. Aljawarneh *et al.*, "The COVID-19 pandemic and E-learning: Challenges and opportunities from the perspective of students and instructors," *Journal of Computing in Higher Education*, vol. 34, no. 1, pp. 21–38, 2022. doi: 10.1007/s12528-021-09274-2
- [4] L. Zhang, J. D. Basham, and S. Yang, "Understanding the implementation of personalized learning: A research synthesis," *Educational Research Review*, vol. 31, 100339, 2020. doi: 10.1016/j.edurev.2020.100339
- [5] MHRD, "National Education Policy 2020," Ministry of Human Resource Development, Government of India, 2020.
- [6] S. R. Virani, J. R. Saini, and S. Sharma, "Adoption of massive open online courses (MOOCs) for blended learning: The Indian educators' perspective," *Interactive Learning Environments*, vol. 31, no. 2, pp. 1060–1076, 2020. doi: 10.1080/10494820.2020.1817760
- [7] K. Fabian, S. Smith, E. Taylor-Smith *et al.*, "Identifying factors influencing study skills engagement and participation for online learners in higher education during COVID-19," *British Journal of Educational Technology*, vol. 53, no. 6, pp. 1915–1936, 2022. doi: 10.1111/bjet.13221
- [8] A. Naim, "Applications of e-learning tools for achieving students learning outcomes," *Journal of Pedagogical Inventions and Practices*, vol. 2, pp. 75–82, 2021.
- [9] A. Bozkurt, I. Jung, F. Xiao *et al.*, "A global outlook to the interruption of education due to COVID-19 pandemic: Navigating in a time of uncertainty and crisis," *Asian Journal of Distance Education*, vol. 15, no. 1, pp. 1–126, 2020. doi: 10.5281/zenodo.3878572
- [10] R. Radha, K. Mahalakshmi, V. S. Kumar *et al.*, "E-learning during lockdown of COVID-19 pandemic: A global perspective," *International Journal of Control and Automation*, vol. 13, no. 4, pp. 1088–1099, 2020.
- [11] S. Goyal, "E-learning: Future of education," *Journal of Education and Learning (EduLearn)*, vol. 6, no. 2, pp. 239–242, 2012. doi: 10.11591/edulearn.v6i4.168
- [12] I. Koreneva, N. Myroshnychenko, L. Mykhailenko *et al.*, "The use of innovative technologies in education: Analysis of effectiveness and implementation at different levels of education," *Cadernos de Educação Tecnologia e Sociedade*, vol. 16, no. 3, pp. 625–638, 2023. doi: 10.14571/brajets.v16.n3
- [13] M. I. Sari, and A. A. Putri, "Exploring online learning tools used by EFL teachers during the COVID-19 pandemic," *Journal of Foreign Language Teaching and Learning*, vol. 7, no. 1, pp. 61–76, 2022. doi: 10.18196/ftl.v7i1.13407
- [14] Lobo, "Virtual physical education: Google Meet as an alternative platform for learning skill-based concepts," *Physical Education of Students*, vol. 26, no. 6, pp. 296–307, 2022. doi: 10.15561/20755279.2022.0604
- [15] M. S. Gupta and P. Warkhedkar, "A study of impact of Edtech companies on education with special reference to BYJU's and Vedantu," *Journal of Education: Rabindra Bharati University*, vol. 23, no. 1, pp. 32–38, 2022.
- [16] G. Mondal, S. Kamila, S. Sarkar *et al.*, "National Education Policy 2020: Initiatives for reforming curriculum and pedagogy in online and digital education," *International Journal of Research and Analytical Reviews*, vol. 10, pp. 389–400, 2023.
- [17] Agarwal, "Digitalized education and NEP 2020: Reinventing the classroom," *Social Science Research Network*, vol. XLVIII, no. 1, pp. 63–72, 2022. doi: 10.2139/ssrn.4956284
- [18] H. Baghel, "An assessment of short-term professional development programme on NEP 2020 & HE: Curriculum and digital pedagogy for teachers and academics," *Education@ETMA*, vol. 2, no. 1, pp. 13–19, 2023.
- [19] E. Redman, C. Murphy, Y. Mancilla *et al.*, "International scaling of sustainability continuing professional development for in-service teachers," *Interdisciplinary Journal of Environmental and Science Education*, vol. 17, no. 3, e2243, 2021. doi: 10.21601/ijese/10936
- [20] S. Dhawan, "Online learning: A panacea in the time of COVID-19 crisis," *Journal of Educational Technology Systems*, vol. 49, no. 1, pp. 5–22, 2020. doi: 10.1177/0047239520934018
- [21] J. Rudolph, S. Tan, and S. Tan, "ChatGPT: Bullshit spewer or the end of traditional assessments in higher education?" *Journal of Applied Learning and Teaching*, vol. 6, no. 1, pp. 342–363, 2023.
- [22] E. Kasneci, K. Sessler, S. Küchemann *et al.*, "ChatGPT for good? On opportunities and challenges of large language models for education," *Learning and Individual Differences*, vol. 103, 102274, 2023. doi: 10.1016/j.lindif.2023.102274
- [23] K. Y. Chan, "A comprehensive AI policy education framework for university teaching and learning," *International Journal of*

- Educational Technology in Higher Education*, vol. 20, 38. doi: 10.1186/s41239-023-00408-3
- [24] Farrokhnia, S. K. Banihashem, O. Noroozi *et al.*, "A SWOT analysis of ChatGPT: Implications for educational practice and research," *Innovations in Education and Teaching International*, vol. 61, no. 3, pp. 460–474, 2023. doi: 10.1080/14703297.2023.2195846
- [25] H. Snyder, "Literature review as a research methodology: An overview and guidelines," *Journal of Business Research*, vol. 104, pp. 333–339, 2019. doi: 10.1016/j.jbusres.2019.07.039
- [26] K. Hanson and B. Carlson, "Effective access: Teachers' use of digital resources in STEM teaching," *ERIC*, 2005.
- [27] V. Singh and A. Thurman, "How many ways can we define online learning? A systematic literature review of definitions of online learning (1988–2018)," *American Journal of Distance Education*, vol. 33, no. 4, pp. 289–306, 2019. doi: 10.1080/08923647.2019.1663082
- [28] R. Serrano, M. A. Dea-Ayuela, E. Gonzalez-Burgos *et al.*, "Technology-enhanced learning in higher education: How to enhance student engagement through blended learning," *European Journal of Education*, vol. 54, no. 2, pp. 273–286. doi: 10.1111/ejed.12330
- [29] Kara, "Distance education: A systems view of online learning," *Educational Review*, vol. 72, no. 6, 800. doi: 10.1080/00131911.2020.1766204
- [30] L. Revere and J. Kovach, "Online technologies for engaged learning: A meaningful synthesis for educators," *The Quarterly Review of Distance Education*, vol. 12, no. 2, pp. 113–124, 2011. doi: 10.1108/QRDE-06-2011-0004
- [31] S. Obradović, D. Bjekić, and L. Zlatić, "Creative teaching with ICT support for students with specific learning disabilities," *Procedia - Social and Behavioral Sciences*, vol. 203, pp. 291–296, 2015. doi: 10.1016/j.sbspro.2015.08.297
- [32] M. Azionya and A. Nhedzi, "The digital divide and higher education challenge with emergency online learning: Analysis of tweets in the wake of the COVID-19 lockdown," *Turkish Online Journal of Distance Education*, vol. 22, no. 4, pp. 164–182, 2021.
- [33] L. Moorhouse and K. M. Wong, "Blending asynchronous and synchronous digital technologies and instructional approaches to facilitate remote learning," *Journal of Computers in Education*, vol. 9, no. 1, pp. 51–70. doi: 10.1007/s40692-021-00195-8
- [34] Heberling, "Maintaining academic integrity in On-Line education," *ERIC*, 2002.
- [35] T. Trust and J. Whalen, "Should teachers be trained in emergency remote teaching? Lessons learned from the COVID-19 pandemic," *Journal of Technology and Teacher Education*, vol. 28, no. 2, pp. 189–199, 2020.
- [36] C. Hodges, S. Moore, B. Lockee *et al.*, "The difference between emergency remote teaching and online learning," *EDUCAUSE Review*, 2020.
- [37] Hockings, P. Brett, and M. Terentjevs, "Making a difference-Inclusive learning and teaching in higher education through open educational resources," *Distance Education*, vol. 33, no. 2, pp. 237–252. doi: 10.1080/01587919.2012.692066
- [38] S. Timotheou, O. Miliou, Y. Dimitriadis *et al.*, "Impacts of digital technologies on education and factors influencing schools' digital capacity and transformation: A literature review," *Education and Information Technologies*, vol. 28, no. 6, pp. 6695–6726, 2023. doi: 10.1007/s10639-022-11431-8
- [39] B. Gupta and P. Gupta, "Strategies to deal with barriers to mentoring faculty members in higher education institutions in the context of NEP 2020," in *Proc. National Conference on Innovations in Technical Education*, NITTTR, Bhopal, 2021, pp. 1–12.
- [40] J. Mishra and K. Dholakia, "The future of hybrid learning models and sustainable education in the post-pandemic era," *Sustainable Practices in Higher Education: Finance, Strategy, and Engagement*, Springer International Publishing, pp. 53–70, 2023. doi: 10.1007/978-3-031-27807-5_4
- [41] M. M. Alamri, "Investigating students' adoption of MOOCs during COVID-19 pandemic: Students' academic self-efficacy, learning engagement, and learning persistence," *Sustainability*, vol. 14, no. 2, pp. 1–15. doi: 10.3390/su14020714
- [42] G. S. Kohli, A. Dandriyal, and P. Goyal, "Enhancing education for IT literacy using spoken tutorials," in *Proc. IEEE International Conference on MOOC, Innovation and Technology in Education (MITE)*, pp. 366–371, 2014. doi: 10.1109/MITE.2014.7020305
- [43] Turnbull, R. Chugh, and J. Luck, "Transitioning to e-learning during the COVID-19 pandemic: How have higher education institutions responded to the challenge?" *Education and Information Technologies*, vol. 26, no. 5, pp. 6401–6419. doi: 10.1007/s10639-021-10633-w
- [44] Niemann, H. Seitzer, K. Martens, "Tackling the digital divide? A comparative policy analysis of international organizations' varying approaches to the digitalization of education," *Journal of Comparative Policy Analysis: Research and Practice*, vol. 27, no. 1, pp. 105–125. doi: 10.1080/13876988.2024.2385361
- [45] UNESCO, Global Education Monitoring Report 2023: Technology in Education—A Tool on Whose Terms, UNESCO Publishing, 2023. doi: 10.54676/UZQV8501
- [46] C. C. Outeda, "European Education Area and Digital Education Action Plan (2021–2027): One more step towards the Europeanisation of education policy," *E-Governance in the European Union: Strategies, Tools, and Implementation*, Springer Nature, pp. 187–206, 2024. doi: 10.1007/978-3-031-56045-3_13
- [47] Y. Jiang, J. Shang, and L. Jiao, "Review of China's online education policy, 1999–2022," *ECNU Review of Education*, vol. 6, no. 1, pp. 155–182, 2023. doi: 10.1177/20965311221099581
- [48] D. Butler, M. Leahy, A. Charania *et al.*, "Aligning digital educational policies with the new realities of schooling," *Technology, Knowledge and Learning*, vol. 29, pp. 1831–1849, 2024. doi: 10.1007/s10758-024-09776-9
- [49] Mathrani, T. Sarvesh, and R. Umer, "Digital divide framework: Online learning in developing countries during the COVID-19 lockdown," *Globalisation, Societies and Education*, vol. 20, no. 5, pp. 625–640, 2022. doi: 10.1080/14767724.2021.1981253
- [50] H. G. Werfhorst, E. Kessenich, and S. Geven, "The digital divide in online education: Inequality in digital readiness of students and schools," *Computers and Education Open*, vol. 3, pp. 1–15. doi: 10.1016/j.caeo.2022.100100

Copyright © 2026 by the authors. This is an open access article distributed under the Creative Commons Attribution License which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited ([CC BY 4.0](https://creativecommons.org/licenses/by/4.0/)).