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National Education Policy 2020: Emerging Technologies a Key Enabler for Sustainable Education

Dr. Sanjeev Sharma
Faculty, University Business School, Panjab University, Chandigarh (U.T), India, drsanjeevedu@gmail.Com

Dr. Luxmi Malodia
Professor, University Business School, Panjab University, Chandigarh (U.T), India, Email:Luxmiroymalodia@gmail.Com.

Abstract
Sustainable education is one of the United Nations' Sustainable Development Goals (SDGs) aimed at achieving a better society by 2030. Governments of emerging nations have made significant strides in expanding and raising educational standards. India's National Education Policy 2020 (NEP-2020) is significant in this sense, notably because it promotes long-term and cutting-edge instructional technologies. To provide Indian education with a clear direction for the next few decades, a critical examination of the NEP-2020 rules on the deployment of Educational Technology is needed. Education and technology are closely intertwined in the policy's focus on early childhood care, inclusive education, and curriculum reform. The policy emphasizes the strategy for preparing educators to overcome the language barrier, offering digital libraries, supporting language learning, and increasing access to available online training resources. The current study focuses on the technological transformation of education policy, encompassing primary, professional, and higher education, as well as the adoption of AI and digital infrastructure. Education 4.0 emerges from a necessity to rethink the educational system in light of the emerging technologies of Industry 4.0, in order to meet the demands of the industry and foster the development of skills through collaboration from diverse backgrounds in IT, academia, start-ups, and government. The internet, digital gadgets, and even power are within reach for many low-income pupils. There is no substitute for human interaction in education, and technology can only be utilized to enhance the learning process. NEP-2020 acknowledges these constraints and accentuates coordinated efforts and practical solutions.

Keywords: NEP-2020, Educational Technology, Sustainable Education, Education 4.0, Information & Communication Technology (ICT), Industry 4.0, and TPACK

Introduction
Today's ultramodern technology enriches human life in every aspect, including education. Education in the future is expected to undergo a significant shift, with technology playing a more prominent role than it already does. Academics, students, and politicians are all focused on the transformation of educational technology, particularly in the realm of information and communication technology (ICT). In light of this, it will be necessary to conduct an in-depth examination from a discerning viewpoint of the National Education Policy 2020 provisions for the adoption of Education Technology (ET) to sharpen its focus and create a vision for Indian education in the forthcoming decades. The research reveals that this vision statement effectively portrays technology adoption without constraints. ICT may help students access vast amounts of information, collaborate, consult experts, and share knowledge, regardless of whether technology is incorporated into the new classroom layout. Additionally, ICTs empower learners with innovative new means for conveying their knowledge through photos,

images, video, graphics, and text (Naidu, 2010). It is essential for every teacher to know how to operate, debug, and support students with these devices (Baggaley, 2012). In the 21st century, technology is viewed as a possible medium for revolutionizing our human society's social and cultural existence. Students of today cannot stay indifferent to technology; hence, the requirement for a cadre of instructors to adept at managing technology-enabled classrooms is critical.

National Education Policy 2020 (NEP-2020):

The HRD Ministry's NEP-2020 is revolutionary in every conceivable manner. The Policy covers a wide range of topics, from the importance of childcare to the role of government, the modification of educational programs, and inclusive education. An underlying theme is the interaction between education and technology. According to Singh & CAM Corporate Team (2020), "One of the primary themes governing the educational system would be the widespread use of technology in teaching and learning, the elimination of language differences, the expansion of access, and the planning and control of education."

Education 4.0 and Industry 4.0:

The educational system shifted over time to meet the demands of changing economic conditions (Aliyu & Talib, 2020). Industry 4.0 is a global economic focus (Cugno et al., 2021) that utilizes robotics, IoT, Digital Manufacturing, Virtual Reality/Augmented Reality, Simulation, Systems Integration, Big Data, AI, Industrial Security, and Cloud computing to enhance efficiency and production (Maier, 2017). We are, therefore, in the era of Education 4.0, in which students take the lead in their own education and teachers assume the role of guides (Fisk, 2017). This allows them to tailor their studies to their own personal rhythm, timetable, and requirements. the education industry is already being dictated by cognitive and cloud technologies, computers, the Internet of Things (IoT), cyber-physical systems (CPS), and several other characteristics imposed by Industry 4.0 (Agrawal, Sharma & Bhatnagar, 2021). According to Qureshi et al. (2021), Education 4.0 supports the enhancement of learning through the use of digital technologies, while also investigating the intersection of digital technologies and education in depth. Researchers have demonstrated the updated educational standards needed by Industry 4.0.

Educational Technology (Utilizing ICT in Education):

The field of educational technology has undergone steady evolution, and the current boom in Information Technology, as well as in Artificial Intelligence (AI), has nearly monopolized the field's attention. The integration of educational technology is a more complicated phenomenon that involves a wide range of tools, strategies, abilities, and resources (Kundu & Bej, 2021). ICT is a broader term that encompasses a wide range of tools and methods for collecting, analyzing, presenting, and transmitting data (Toomy, 2001). An ICT system encompasses all of these devices and their accompanying services and applications, such as videoconferencing and distance learning, as well as the hardware and software associated with each communication medium. Teachers' education curricula in many industrialized nations in Europe and North America are increasingly incorporating Information and Communication Technology (ICT) into the curriculum, which is expected to continue worldwide (Guo et al., 2016). Teacher education programs may be improved by using ICTs and integrating information and communication technologies into the curriculum of education systems at both the pre-service and post-service levels (Dash, 2014).

The Technological, Pedagogical, Content Knowledge (TPACK) framework:

Undertaking all the factors at once promotes successful teaching through technology integration, according to the TPACK framework, which enables researchers and educators to analyze how well preservice and in-service teachers are being prepared to utilize modern technological means effectively in the classroom (Naidu, 2010). Teachers who want to master educational technology must do more than learn how to utilize the newest gadgets; they must also learn how to navigate the intricate web of interactions between students, teachers, and the many technologies they employ (Unwin, T., 2004). Mishra and Koehler's (2006) theory of TPACK was employed as an academic foundation in the research study.

Sustainable Education:

Sustainability and education comprise sustainable education. The former enhances the quality of life by maintaining ecological, social, and economic equilibrium (Jeronen, 2022). The latter emphasizes learning and teaching new things, encouraging critical thinking, and educating for a better quality of life (Thesaurus, 2021). Today's problems need to be solved in a way that promotes sustainable living, and a mindset shift is required. Sustainable education can influence culture, says Stephen Sterling (2008). Education for Sustainable Development (ESD) is another name for sustainability education, and it has been described as follows (UNESCO, 2014); "Education for Sustainable Development makes it possible for every person on the planet to acquire the knowledge, abilities, attitudes, and values necessary to build a future that is sustainable."

Literature Review

National Education Policy 2020

Srivastava (2020) noted that the actions outlined in NEP 2020 are executed methodically. In the words of Kiran Hazarika, a member of UGC who is associated with NEP formulation, “a positive outcome in another decade. This will lead to liberal education in the coming times. We will save the youth from unnecessarily running after redundant degrees," he said. T.G. Sitharam, Director, IIT Guwahati, portrays futuristic aspects of NEP 2020 as a knowledge hub, an Entrepreneurial mindset, and multi-disciplinary learning. "India needs to create an army of tech-enabled youngsters willing to take calculated risks," says Byju Raveendran, Founder and CEO of BYJU'S. Multidisciplinary learning - Rote learning is becoming obsolete, and vocational training is gaining traction in the mainstream curriculum. According to Rajesh Panda, Founder and CEO of Corporate Gurukul, Singapore, universities will no longer be able to exist only on student tuition payments. On the other hand, corporate and governmental support for research will become more significant.

Mundra (2020) stated that the NEP-2020’s finest feature is that it fosters a holistic approach to teaching and learning. In the future, Indian students will be more competitive with their overseas counterparts. Reforming higher education institutes in India to turn them into multidisciplinary schools with 3,000 or more students will improve the standard of higher education, thereby giving them a chance to succeed. The Policy, on the other hand, is more input-oriented and focuses on the outcome, which is employability or work readiness.

Aithal and Aithal (2020) emphasize the necessity of a comprehensive and contemporary education strategy for a country at the elementary and secondary school levels, as education is instrumental in driving economic and social progress. To revitalize the Indian education sector, the current government has introduced a comprehensive National Education Policy (NEP) 2020, which envisages an India-centred education sector that significantly contributes to the

nation's sustainable transition into an egalitarian and thriving knowledge society by providing high-quality education to all.

Tadepalligudem (2020) claimed that the NEP 2020 has placed a premium on the use of educational technology to sharpen its focus and provide a vision for Indian education over the following decades. Three fundamental components of NEP 2020 have been decoded in this rational content analysis: educational, institutional, and human factors. The relevance of these variables has been demonstrated in the current literature, and their orientation with the Policy has been examined.

Nandini (2020) stated that India officially announced the long-awaited and anticipated National Education Policy (NEP) 2020, with the tagline 'Educate, Encourage, Enlighten,' on 29 July 2020. After 34 years, this policy paper was released. It places far more emphasis on instilling 21st-century abilities in students, reviving enthusiasm for exploration and innovation, and transforming India into a knowledgeable society.

Education Technology Transformation (Information and Communication Technology in Indian Education):

Widodo et al. (2021) asserted that the millennial period is defined by the rapid adoption of ICT in many facets of daily life. This is no exclusion in the area of learning and education, where countless innovations and uses of IT contribute to the overall growth of education. Indonesian academics have also benefited from an expansion in the use of ICT. The Governance and education processes in education have undergone certain alterations as a result of information technology.

Simanjuntak (2015) stated that when Indigenous people utilize information and technology, the availability, conditions, and requirements of these groups should be considered. This suggests that when integrating technology and information into educational programs, the educational community's readiness and expectations must be taken into account.

Meador (2014) suggested that technological advancements have accelerated dramatically in the twenty-first century. Schools have benefited from these improvements as well. Classroom technology has grown in popularity as a tool that enables teachers to engage with students actively in their education. Due to today's "digital natives," technology can be utilized efficiently in the classroom. Fu (2013) demonstrated that there is a widespread assumption in developing nations today that ICTs are effective instruments for transforming education and thereby enhancing the norms and criteria governing teaching and learning processes. As a result, excellent education contributes to the nation's economic prosperity.

Skoretz (2011) stated that this report cited PCs and interactive whiteboards as the most often utilized classroom ICTs. Whether or not a teacher employs ICTs is dependent on the teacher's effectiveness. An individual's lack of self-efficacy in utilizing ICTs in the classroom will prevent them from using the technology.

Bingimlas (2009) noted that teachers may encounter obstacles when attempting to adopt new technologies in the classroom to provide students with an adequate education.

Sustainable Education:

According to UNESCO's Global Education and Monitoring Report 2020, 91% of the worldwide student population in 194 countries was impacted by school and university closures due to the COVID-19 lockdown in April 2020. During this period, tech-based interventions in early childhood education, elementary and secondary schools, and universities experienced significant growth. Alkhaldi and Altaei (2022) said education is a right that must be safeguarded and upheld. Sustainable development requires reform. This research underscores the significance of education during times of crisis. It provides Bahrain's unique experience, particularly in its rapid response to transitioning to remote education, which paralleled the development of Bahraini digital education. Ultimately, planning for crises requires staying up-to- date on digital technologies and AI, as well as building the necessary infrastructure and training to enhance the academic cadre and student abilities. Governments should draw from their own and other nations' experience in order to mitigate future crises and secure the survival of the human race.

Davim (2015) stated that higher education is an emerging field of considerable interest to academics. Sustainability in Higher Education explores the sharing of knowledge across various facets of sustainable academic practices. Sustainability encompasses a wide range of fields of inquiry and professional activity. The Brundtland Report characterizes sustainable development as "Development that fulfils existing demands without jeopardizing future generations" (Mondini, 2019).”

Hesselbarth, Buhr, and Schaltegger (2015) found that firms play a key role in sustainable development. The need for organised knowledge and skills to grasp corporate sustainability has generated a new profession: sustainable management. Therefore, management education for sustainability necessitates sustainable pedagogy and a business curriculum.

Rationale Of The Study:

The learning process is changing as we approach a new era of digital education. A new teaching-learning paradigm is emerging in comparison to the conventional one. Researchers, businesses, governments, and citizens all seek to explore new economic opportunities enabled by information and communications technology (ICT). Technology has revolutionized nearly every aspect of civilization, making it challenging to compete worldwide. Additionally, it is altering our expectations for what children must study to navigate the new global economy (Kereluik, Mishra, & Koehler, 2011). This work is both critical and timely, as it enables students to acquire new 21st-century skills through the integration of education and technology. The literature on this topic is not as rich as it should be. As a result, the current conceptual research has been conducted to address the identified gaps.

Research Methodology:

This study mainly depends on secondary data sources due to its conceptual nature. This technique encompasses a diverse range of research-based papers, empirically tested articles, relevant books, websites, conferences, webinars, and published proceedings related to the intersection of education and technology, with a specific emphasis on NEP 2020. As a result, several databases such as Emerald Group Publishing, Taylor & Francis Online, SAGE Publications, Social Sciences Citation Index, Wiley Online Library, Web of Science, ERIC, Science Direct, United Nations’ Sustainable Development Goals Report 2020, UNESCO’s Global Education and Monitoring Report 2020 and webpages have been referred and reviewed rigorously.

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Objectives Of The Study

- To explore and compile findings/discussions showcasing several futuristic features of NEP 2020 for making education sustainable through emerging educational technology.

- To identify the challenges and obstacles that impede NEP 2020 from being fully implemented in the specific context of Information and Communication Technologies (ICTs) to establish a sustainable educational system:

Findings And Discussions Of The Study:

- **DIKSHA (Digital Infrastructure for Knowledge Sharing) is a visionary initiative of the "one nation, one digital platform" in schools, aimed at promoting sustainable and inclusive education, led by the HRD Ministry, Government of India.**

According to the UN's Sustainable Development Goals Report 2020, 500 million youngsters can't access remote learning programs. Rural and special-needs children are most affected. India prioritized inclusive learning in remote areas with limited internet access and poor electricity infrastructure. DIKSHA offers QR-coded Energized Textbooks (ETBs) and teacher training courses. A Direct-to-Home (DTH) channel featuring sign language study material was provided for pupils with visual and hearing impairments (Sharma, 2020).

- **Futuristic Aspects of NEP 2020 in terms of Primary, Professional, and Higher education, adapting AI and digital India, portraying interplay/integration of education and technology**:

Singh and the CAM Corporate Team (2020) praised NEP 2020 for supporting primary, professional, and higher education, as well as AI and digitalization. The NEP emphasizes the relevance of technology in helping instructors, bridging existing gaps between teachers and learners, and building digital databases and libraries. The Policy fosters transdisciplinary research and innovation, recognizing the relevance of technology in addressing societal concerns. It established the National Educational Technology Forum (NETF) to explore how technology can enhance secondary and postsecondary education. The Framework outlines "AI's" challenges and underlines the role of adapting to its growing application across sectors. The Program researches privacy and data in future disruptive technologies.

- **NEP will serve as a melting pot for a countrywide end-to-end education plan that ensures coherence and continuity:**

Mundhra (2020) mentioned the words of Dr. Roshan Lal Raina, Vice-Chancellor, JK Lakshmipat University, "the government's New National Education Policy and its integrated approach to key developments. It was an essential revision to bring the NEP into line with the interdisciplinary, digital world. This will help the next generation of students and graduates who will lead our nation in the future. This Policy will provide them the skills and resources to meet current and future needs."

- **Artificial Intelligence, Education, and Sustainability: an endearing blend**

The agenda of the UN report "Transforming our world: the 2030 Agenda for Sustainable Development" (2015) underlined that improving people's lives and fostering long-term growth begins with providing them access to high-quality education. Akcapinar et al. (2019) supported this claim and stated that AI has a strong potential to reduce educators' everyday workload, thereby improving the teaching-learning process and student learning outcomes.

- **Education 4.0 India- A Collaborative Initiative by WEF, UNICEF, and YuWaah:**

The World Economic Forum study examines the progress and findings of the Education 4.0 India programme, which aims to leverage Fourth Industrial Revolution technology to maximize learning and reduce educational access disparities in India. The paper provides scalable strategies to prepare India's young for the global workforce. Education 4.0 India aspires to improve education, skilling, and employment in India (Jurgens & Kimura, 2022).

- **30 years after the internet's inception, India's educational system is founded on cutting-edge technology:**

The NEP-2020 is open, forward-looking, and progressive. Krishna Kumar, Simplilearn's CEO, stated, "In India, where we're all marks-driven, the new regulations emphasize practical knowledge and abilities above textbook knowledge. This step will help create a trained workforce for the future and close the demand-supply mismatch. The use of technology for learning, teaching, and e-content with an emphasis on regional languages is another feature (Mundhra, 2020)."

- **Digital and online learning has its unit:**

A specialized unit within the MHRD will be established to coordinate digital setup, curriculum, content, and competency building, catering to the needs of both schools and universities. Online education has been recommended in reaction to recent epidemics and pandemics to ensure readiness with alternate means of high-quality education if conventional modes of education are unavailable (Nadini & HT, 2020).

- **Reform in teacher qualifications to emphasise vocational skills, coding from early on, and a technology curriculum;**

Robin Bhowmik, Chief Business Officer of Manipal Global Academy in the BFSI sector, stated that the NEP 2020 is a welcome move, as it places a greater emphasis on vocational skills, coding skills, and technical curricula, focusing on real-world skills that lead to employment. Having the ability to think quantitatively and analytically, as well as the disposition to find solutions to problems, is required for job seekers to remain relevant in the industry. Another critical aspect is research, which requires aggressive implementation on college campuses because a generation's future is contingent on it, and the prosperity of a country depends on excellent research talent.

- **To highlight the NEP 2020 targets to build "India a global knowledge superpower":**

The Union Minister of Education, Mr. Ramesh Pokhriyal 'Nishank', stated in the Hindustan Times (2021) that the National Education Policy aims to transform India into a global information powerhouse by providing equal access to quality education for all students. 33,000,00 Indian students are enrolled in 1,004 schools and 45,000 colleges as a result of revisions to the country's New Education Policy (NEP). Students, teachers, scientists, and non-governmental groups all contributed to the creation of this policy. Considering that it affects everyone, this is the most important innovation ever. More students will pursue vocational training under the new education policy, and interdisciplinary institutes like the IITs will become more prevalent. This NEP 2020 will bring many critical changes to India's educational landscape.

- **Teaching with new technology is a key paradigm change in the field of**

education in the twenty- first century:
As stated by Chigona (2015), pre-service education is now the norm. For this reason, teachers should graduate from teacher preparation programs with the knowledge and skills necessary to effectively implement cutting-edge Information and Communication Technologies (ICTs) in the classroom. An overarching conceptual framework, known as TPACK, served as a guide for this investigation.

- **Adult education via apps, TV channels, and other technology:**

Online courses, content, curriculum, modules, satellite TV channels, Adult Education Centers, and online publications are just a few of the technology-based options that are predicted to be available to adults (Nadini & HT, 2020).

- **No more rote learning or rat race; just futurist skill-based education:**

Mundhra (2020) cited the futurist, skills-based opinions of Mr. Ravi Kaklasaria, CEO & Founder of Spring People, regarding NEP 2020. "The NEP is a long overdue overhaul of our educational system. My impression is that it incorporates some of the most effective pedagogical strategies employed worldwide, while also catering to the specific needs of our multifaceted nation. The use of regional languages or mother tongues as the medium of education is a prominent illustration of this principle at work in NEP. In a period of increasing globalization, this will go a long way toward re-establishing the value of our country's diversified population, culture, language, and economy."

- **A Robust Structure for Indian Teacher Education's Integration with ICT:**

This conceptual research was conducted to develop a practical framework for integrating Information and Communication Technologies (ICTs) into the teaching practices of Indian schools. The study's results were incorporated into a plan for Indian teacher education in the twenty-first century, tailored to meet the educational challenges facing India today. (Kundu, 2021).

- **A structure to facilitate the development of participants' self-efficacy in the context of online education:**

Kundu (2020) found that self-efficacy, or one's degree of confidence in one's ability to accomplish a task, is a significant component for instructors and students using online platforms, and that increased self- efficacy can promote online activities. Researchers proposed a paradigm for enhancing participants' self- efficacy through intervention measures that would make online education more successful and effective. Stakeholders in the online education sector may benefit from the proposed structure. With this concept, online education might gain a new dimension if participants' inner motivations are aided.

Information And Communication Technologies (Ict) For Making Education Sustainable: Barriers And Challenges

Incorporating technology into "education" has been a strong point of the Policy in the Indian context, but this poses some challenges that must be addressed.

- **Internet penetration is higher in metropolitan regions than in rural areas:** An official government survey released in November 2019 found that just 4.4 percent of rural Indian homes own computers, compared to 23.4 percent of urban homes, and approximately 14.9 percent of rural households had access to the internet. As a result, urban areas have a higher percentage of residents with internet access than rural ones. When it comes to

accessibility, many students from low-income homes lack access to computers, the internet, and electricity (Singh & CAM Corporate Team, 2020).

- The **'human aspect'** of education is important to remember because it is all related to the human experience, and technology should be used as a complement to help students learn more effectively. Additionally, it is crucial to examine how technology is utilized, processed, transferred, and stored, and to implement the necessary safeguards to safeguard user privacy and prevent data theft (Singh & CAM Corporate Team, 2020).

- While ICT has the potential to enhance education systems significantly, this is not the case in **underdeveloped/ developing nations**. The incorporation of information and communications technology (ICT) education into the educational systems of these emerging nations faces a myriad of challenges and problems. There is a critical lack of enthusiastic teachers who have received specialized education in information and communications technology (Jones, 2004).

- **Inadequate education and a lack of professional development programs** for incorporating technology into present curricula were highlighted as key obstacles to educational institutions adopting ICT (ChanLin et al., 2006; Georgina & Hosford, 2009).

- **An unfavourable organizational culture, as well as a negative mindset and set of beliefs,** often found in impoverished countries, leads educational institutions to overlook the significance and seriousness of ICT's role in educational advancement. Furthermore, the professors' attitudes and views are archaic and rigid. They are uninformed, dogmatic, and unwilling to adjust to change (Kundu & Dey, 2018).

- Rural schools have challenges in **maintaining and upgrading ICT equipment** due to their low budgetary resources. Government endeavors are frequently constrained by fiscal restrictions. 2018 (Kundu & Dey).

- **A mismatch exists between complementary resources, resulting in an unproductive combination of ICT resources, which leads to** decreased technology dissemination and inadequate ICT comprehension in these educational institutions. To foster a creative society, a software environment that encourages active learning, participatory and collaborative behaviours, and information exchange is required (Kundu & Dey, 2018).

Limitations Of Study:

The present study is conceptually based on a literature review, and thus, it has the scope of an extensive empirical study that can highlight various research aspects related to the successful adoption of Education Policy 2020, with the effective interplay of education technology transformation.

Conclusion:

The Policy is a groundbreaking and forward-thinking statement that recognizes the vital role of technology in enhancing learning and teaching. Industry 4.0 technologies are designed to support the entire learning process, but they are often underutilized. They are still primarily used in academic settings, particularly manufacturing- related programs at universities. It is envisioned that this effort will aid in advancing Education 4.0 across the pedagogical

spectrum, making education more sustainable (Moraes et al., 2021). It is crucial to develop a comprehensive strategy for enhancing technical proficiency, enabling seamless interaction with technology and its future advancements, while ensuring robust data protection and privacy safeguards (Singh & CAM Corporate Team, 2020). Education technology businesses can partner with educational institutions to create customized online courses, thereby expanding their reach among students (Kumar, Gupta, & Khetan, 2020). Additionally, the Policy facilitates extensive collaboration among industrial players, regulatory authorities, and educational institutions. 2020 (Mundhra). The administration appears to be making sufficient progress toward establishing the necessary educational technology infrastructure. Between 2017 and 2020, the use of information technology in education in Indonesia saw a spike in innovation in the creation of learning media and educational governance facilities (Widodo et al., 2021). There is a growing need to use technology in education in India, which has become a "information-intensive society" in the recent decade.

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