International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

From Chalkboards to Clickboards: Technology Integration and Instructional Innovation in India's NEP 2020 Framework

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ABSTRACT

Education serves as the foundation for India's socio-economic progress, influencing its development and position on the global stage. A nation like India can greatly contribute to a new approach to educational advancements in the 21st century by establishing key pillars for a dynamic and sustainable education system throughout its diverse regions. The National Education Policy 2020 (NEP 2020) seeks to transform education in India through digital initiatives by integrating technology into knowledge acquisition and pedagogical creativity. This policy has opened the doors to redefine the educational landscape through a broad array of innovations. The traditional education systems of old classrooms have now taken a back seat and have undergone significant transformations to find complete alternatives in digital adaptive learning platforms and effective teaching methods, which have been encouraged to facilitate and ensure successful learning. According to NEP 2020, Indian education should embrace a more comprehensive, learner-centred, experiential, inclusive, interdisciplinary, constructivist, and globally competitive framework. The primary aim of this study is to explore the recommendations from NEP 2020 which encompasses reimagining our education system and to examine how NEP 2020 is overhauling the pedagogical frameworks to incorporate machine learning and technological advancements. This research adopts a qualitative approach, utilizing the guidelines from NEP2020. Various journals and articles serve as secondary sources for this study. The paper emphasizes that experience-based learning, learning through practical engagement, unobtrusive learning, and playful learning .are representative examples of innovative techno-pedagogical methods that align well with the objectives of NEP 2020. To reach this objective, NEP 2020 includes various teaching and learning approaches, such as blended learning, flipped classrooms, concept mapping, the use of AI and digitization in education, and learning through gamification, among others. Additionally, this paper highlights the challenges faced and proposes potential solutions for implementing digital hybrid classroom learning in the 21st century.

Keywords: Pedagogy, Technology, Innovation, NEP 2020, Indian education, Transformation.

INTRODUCTION

The 21st century marks an era characterized by a surge of knowledge and discovery. The rapid advancement of computer technology has permeated the field of education, significantly impacting the educational system over the years. Recently, there has been a growing interest in utilizing computers and the internet to enhance the effectiveness and efficiency of education across all levels, including both

formal and informal learning environments. It is essential for educators to adopt new approaches to meet the expectations of 21st-century learners. Various technological applications in teaching provide educators with insights into their own knowledge as well as that of their students, facilitating exploration into how they can implement positive changes in the teaching and learning process.

Techno-pedagogy can be viewed as the integration of teaching technologies into the learning context itself. This approach necessitates a mindful acknowledgment of the mediated learning environment to optimize the clarity and ease of information sharing. Effectively leveraging technological advancements in the classroom benefits student development and achievements, motivates learners, and transforms the role of teachers. Furthermore, employing technology in education allows instructors to provide individualized attention to each student, enhances student interaction, and fosters engagement, turning them into more active participants in their learning. Technology-enhanced classrooms equip both teachers and students with continuous access to information, unlike previous generations. Therefore, it is crucial for educators to cultivate techno-pedagogical competencies to address the evolving challenges and requirements of students and the broader educational landscape.

SIGNIFICANCE OF THE STUDY

- To study about the comprehensive frameworks of NEP 2020 in the field of technology integrated teaching-learning process.
- To review the role Techno-pedagogical innovations in achieving NEP 2020 vision.
- To develop knowledge about the various methods and approaches of technology based knowledge and pedagogy and its implications in the classroom environment.
- To qualitate about the loopholes of technology based classroom learning and the process to overcome this challenges.

NEEDS OF TECHNO-PEDAGOGICAL SKILLS IN THE 21ST CENTURY INDIA

In today's educational landscape, teachers play a central role in shaping learning experiences. Technology encompasses a wide range of processes that rely on making informed choices about the appropriate techno-pedagogical strategies to effectively engage students with the content. The use of media in education is essential for students' development, and cultivating critical media skills is increasingly important. To grasp the relationship between technology, media, and learning, it is vital to explore how technological concepts relate to education and content delivery. Instructors, along with educational institutions, need to define and clarify how technology and skills intersect, focusing on how technological resources and strategies can enhance student engagement and learning outcomes (Saravanakumar AR, Paavizhi K., and Palanisamy P., 2019).

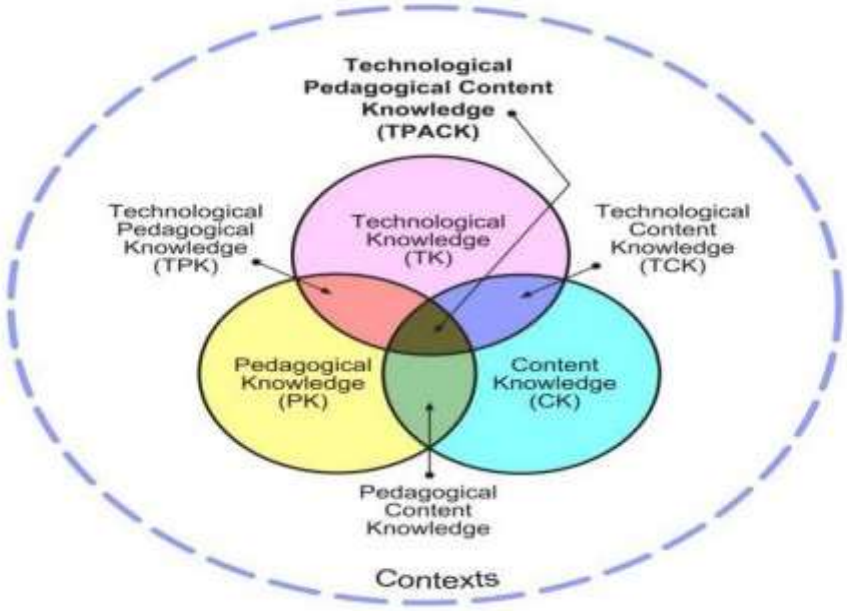
Technology facilitates effective, user-centred, interdisciplinary, self-paced, and real-time learning. It caters to the diverse needs of individual learners and is applicable across various teaching methods, making it a popular choice in education. By using technology, students can cultivate higher-order thinking skills such as analysis, synthesis, application, and creation, which are crucial in today's competitive environment. It is essential for educators to comprehend techno-pedagogy and its practical applications in teaching. They should learn how to effectively integrate techno-pedagogical approaches into their subjects while designing courses and creating learning opportunities. The chosen technological tools should align with the educators' knowledge and support students in constructing quality knowledge. By developing technical teaching skills, educators can address the personal needs of

students in an inclusive manner, allowing learners to grasp concepts more effectively and retain information better. Mastering professional teaching skills can make the teaching experience more enjoyable for educators and facilitate deeper learning for students.

CONCEPT OF TECHNO-PEDAGOGICAL COMPETENCY

- **Technological Competency:** Competency generally refers to the capacity to perform a task effectively or efficiently. It is described as being "adequate for the purpose, suitable, sufficient, or legally qualified, admissible, or capable." Related terms for competency include capability, ability, proficiency, expertise, and skill. Just like professionals in various fields utilize specialized technologies to enhance their work, educators must also become proficient in leveraging technology as educational software continues to advance across different academic disciplines. Technology serves as a valuable support for educators in many professional tasks, particularly in fostering learning beyond traditional classroom walls, while simultaneously broadening our understanding of technological tools and resources.
- **Pedagogy:** Pedagogy concerns itself with the theory and methods of teaching. The term comes from two Greek words: "paid," meaning child, and "agogos," meaning leader. Thus, pedagogy translates to "leading the child," and can be defined as the art and science of teaching children. It represents the profession of teaching and the preparatory training involved with it. Pedagogy entails a comprehensive strategy that specifies what teachers should do in the classroom. It shapes teaching methodologies, teachers' actions, and their judgments, taking into account learning theories, the needs of students, and their backgrounds and interests. Various pedagogical approaches include the twenty "natural types" outlined by Khan (2000), which encompass Presentation, Demonstration, Games, Storytelling, Simulations, and more.
- **Pedagogical Competency:** Teaching is an art, and certain strategies are more effective for imparting specific knowledge and skills compared to others. The choice of strategy often depends on students' backgrounds, learning approaches, and capacities (Notify-RSS, 2002). Implementing the most effective pedagogical methods in classrooms promotes individual and community well-being. Pedagogical competency encompasses more than just verbal communication; it requires understanding diverse instructional methods and approaches. It also reflects the teaching qualifications of educators, with a focus on the quality of instruction as a primary concern. This competence is grounded in comprehensive and up-to-date knowledge of the subject matter, along with insights into student learning and subject-related teaching challenges.
- **Techno-Pedagogical Competency:** This approach combines technology and pedagogy in a teaching framework. Teachers who possess techno-pedagogical competency can skilfully integrate these elements into their teaching practices, effectively bringing global resources into the classroom. This form of competency allows educators to utilize technology in teaching effectively. A teacher well-versed in both technological and pedagogical principles needs to understand all the components, functions, and possibilities of various educational technologies. For instance, instead of relying solely on face-to-face interactions for cooperative learning, one could effectively use tools like Google Docs or Google Hangouts. The evolution of techno-pedagogical knowledge has led to innovative concepts like online learning, exemplified by Learning Management Systems (LMS), MOOCs, and MOODLE, which seamlessly blend technical knowledge with pedagogical methods. In techno-pedagogy, three primary areas of knowledge are crucial: content, pedagogy, and technology.

Content refers to the subject matter being taught, while technology includes tools like computers, the internet, digital media, and traditional resources such as projectors and blackboards. Pedagogy encompasses the practices, strategies, and methods of teaching and learning, including instructional aims, assessment, and understanding student learning.



The Dimensions of the Technological Pedagogical Content Knowledge Approach (Source: Koehler & Mishra, 2009)

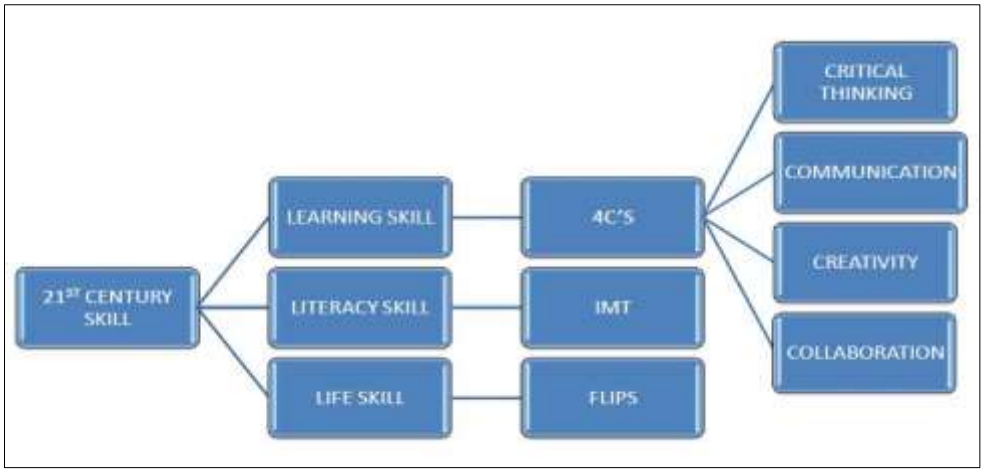
SKILLS IN THE 21ST CENTURY

21st-century skills encompass a collection of competencies, knowledge, and abilities critical for achieving success in today's rapidly changing world, shaped by technological advancements, globalization, and shifting societal demands. These skills extend beyond traditional academic knowledge and play a vital role in navigating an interconnected and dynamic landscape. The Three Categories of 21st Century Skills.

These skills can be categorized into three main groups:

1. Learning skills
2. Literacy skills
3. Life skills

- **Learning Skills (The Four Cs):** The four Cs of learning skills focus on the cognitive processes necessary for adapting to and improving within a modern work setting.
- **Literacy Skills (IMT):** Literacy skills emphasize the ability of students to identify reliable sources of information and the technologies that facilitate this process. Distinguishing between credible information and the vast amount of misinformation available online is essential.
- **Life Skills (FLIPS):** Life skills encompass the abstract elements of a student's everyday life, addressing both personal and professional traits.



TECHNO-PEDAGOGICAL SKILLS IN THE 21ST CENTURY

This discussion particularly highlights **learning skills** within the realm of techno-pedagogical enhancement, emphasizing the importance of fostering a supportive learning environment, guiding students' intellectual and social development, and nurturing a passion for learning.

The four Cs are arguably the most recognized talents associated with 21st-century skills. Often referred to as learning skills, these competencies are vital across various professions, and their significance can vary according to an individual's career goals.

Let's explore each of these competencies and their relevance to students' future careers.

- **Critical Thinking:** Solving Problems Critical thinking is one of the most essential abilities for modern professionals. It enables students to tackle problems and innovate within the classroom, equipping them to independently resolve challenges when assistance from educators is unavailable.
- **Creativity:** Thinking Innovatively Creativity is as crucial as adaptability. This skill allows students to approach ideas from various angles, fostering innovative thinking. Recognizing that "the traditional way" is not always the best approach is key to learning creativity. It entails realizing that change may be necessary to discover new solutions.
- **Collaboration:** Teamwork Collaboration involves working effectively with peers, negotiating agreements, and enhancing outcomes in problem-solving. Among the four Cs, collaboration can be the most complex to master.
- **Communication:** Effectively Sharing Ideas It is crucial for students to develop the ability to communicate ideas effectively across different personality types. Mastering this skill allows them to become valuable contributors to their teams, departments, and communities.

KEY GUIDELINES OF NEP 2020 FOR INNOVATIVE TEACHING AND LEARNING

The National Education Policy (NEP) 2020 highlights the critical role of technology in enhancing teaching and learning methodologies. Below are some essential guidelines:

1. **Widespread Technology Adoption:** NEP 2020 advocates for a broad adoption of technology in educational practices to eliminate language barriers and improve accessibility for students with disabilities.
2. **Creation of an Educational Technology Forum (NETF)**: The policy suggests the formation of a National Educational Technology Forum (NETF) to support the seamless incorporation of technology into educational settings.

3. **Promotion of Digital Literacy:** NEP 2020 seeks to enhance digital literacy among both educators and students, equipping them to effectively incorporate technology into their instructional and learning approaches.
4. **Shift in Learning Approach:** NEP 2020 emphasizes a shift towards inquiry-based, experiential, and problem-solving learning methods. It prioritizes project-based learning, discovery learning, and application-based approaches over traditional memorization, integrating technology to enhance the educational experience.
5. **Holistic Education:** This policy advocates for a comprehensive, inclusive, and interdisciplinary approach to education that prepares students for the future.
6. **Innovative Pedagogies:** By incorporating various teaching methods, including digital resources and online platforms, NEP 2020 enhances the assessment process in teaching and learning.
7. **Flexible teaching**: It also allows teachers the flexibility to explore innovative instructional strategies, fostering a motivated and creative educational environment.
8. **Integration of Technology:** The policy focuses on three teaching modes that promote constructive learning and active learner engagement, aligning with the needs of 21st-century education and making the learning experience enjoyable.
9. **Modes of Teaching**: NEP 2020 outlines several modes of instruction, including: - Online mode of teaching - Offline mode of teaching - Blended mode of teaching.

INTERVENTIONS FOR PROMOTING INNOVATION

- **Nurturing an Innovative Culture**: Educational institutions need to create an environment that encourages experimentation, creativity, and ongoing improvement. This means giving educators the freedom to take risks, try out new teaching methods, and view feedback as an opportunity for growth. Administrators are essential in providing the necessary resources, support, and recognition to motivate innovative practices.
- **Leveraging Technology:** Technology acts as a crucial driver of innovation within the educational framework. Tools such as interactive whiteboards, multimedia presentations, online collaboration platforms, and virtual reality can greatly enhance the learning experience. However, effective integration of these technologies requires careful planning, professional development for teachers, and fair access to digital resources for all students.
- **Blended Learning:** Blended learning combines traditional teaching methods with technology-driven approaches. This hybrid model allows for greater flexibility in learning and fosters creativity among students. Through this approach, learners benefit from a wealth of online resources, such as computer-mediated instructions and e-modules. Instructors can facilitate engaging online activities like group discussions, exams, and assignments. This method is cost-effective and adaptable in terms of time and space, promoting digital literacy—an essential skill in today's digital age. Additionally, it helps students develop professionalism and keeps them updated on the latest technological advancements (Mynbayeva et al., 2018; Quazi, 2021; UGC, 2020).
- **Concept Mapping:** Concept mapping is a visual representation that illustrates the relationships between information and its sub-topics, ranging from specific to abstract ideas. These maps can take various forms, such as flow charts, spider webs, or Venn diagrams. They aid in comprehending complex ideas by organizing information hierarchically and using linking phrases. The concept mapping technique enhances understanding, facilitates better retention of information, and promotes

critical and higher-order thinking skills, allowing learners to explore concepts deeply and correct misconceptions through trial and error (Patrick Ajaja, 2013; Tanner, 2013).

- **Constructivist Approach:** This approach emphasizes a teaching model often referred to as the "Five Es," created by The Biological Science Curriculum Study (BSCS) with Roger Bybee leading the project. This framework consists of five stages: Engage, Explore, Explain, Elaborate, and Evaluate, guiding the learning process in the classroom. It fosters an engaging learning environment where students first encounter a task, connect prior knowledge with new experiences, actively engage in the learning process, abstractly explain the concepts with assistance, elaborate on what they've learned, and finally assess their own understanding. Teachers are responsible for identifying any misconceptions that arise during this learning journey (Ismail & Elias, 2006; Bada & Steve, 2015).
- **Personalized Learning Approaches:** The traditional one-size-fits-all educational model is increasingly being replaced by personalized learning strategies that address the unique needs, interests, and learning speeds of each student. This can be accomplished through resources like adaptive learning technologies, varied instructional methods, hands-on project work, and assessments based on individual competencies. Such personalization empowers students, promotes self-directed learning, and enhances intrinsic motivation, ultimately resulting in more profound educational outcomes.
- **Collaborative and Cooperative Learning Environments:** Collaboration is essential for fostering innovation within education. Involving educators, students, parents, and community members can lead to the development and execution of creative teaching strategies. Professional learning communities create spaces for educators to exchange effective practices, participate in collaborative learning, and collectively devise innovative responses to educational issues. Forming alliances with sectors such as industry, higher education, and non-profits can further enrich learning experiences by providing students with practical applications of their knowledge.
- **Flipped Classroom Approach:** The flipped classroom approach challenges conventional teaching methods by moving instructional content to an online format before classroom sessions, enhancing in-class time with interactive activities, discussions, and hands-on projects. This model encourages active engagement, supports more tailored instruction, and allows students to control the pace of their learning.
- **Integration of Gamification and Game-Based Learning:** Gamification enhances educational experiences by integrating game-like elements such as points, badges, and leader boards into learning activities, boosting student engagement and motivation. In contrast, game-based learning employs educational games and simulations to convey academic concepts and skills in an engaging, hands-on way. By leveraging students' natural enjoyment of play, these methods can lead to a more enjoyable and effective learning experience.
- **Experiential and Project-Centred Learning:** Experiential learning places students in real-life situations where they can apply theoretical concepts to resolve genuine challenges, conduct research, or participate in internships and community service projects. On the other hand, project-based learning involves teams working on prolonged, interdisciplinary projects that demand critical thinking, creativity, and collaboration. These practical strategies encourage deep understanding, nurture vital life skills, and equip students for success in their future careers.
- **Promoting Global Skills:** In an increasingly connected world, it is crucial for students to acquire global competencies, including cultural awareness, intercultural communication skills, and a sense of

global citizenship. Innovative teaching methods can weave global perspectives into the curriculum through initiatives like cross-cultural exchanges, virtual collaborations with peers from varying backgrounds, and opportunities for international travel and studying abroad. By instilling a global outlook, educators can prepare students to succeed in a multicultural landscape and help them contribute to worldwide solutions.

- **Data-Driven Decision Making**: Utilizing data analytics and learning analytics tools allows educators to gain meaningful insights into student performance, learning styles, and areas that may need attention. By examining information sourced from assessments, surveys, and digital learning environments, teachers can customize their instruction to address individual student needs, recognize trends and patterns, and continually enhance their teaching methods. This approach of data-driven decision making empowers educators to improve the learning experience and achieve better outcomes for students.
- **Ongoing Professional Development**: To encourage innovation within the educational process, educators must have access to continuous professional development opportunities that keep them informed about new trends, teaching methods, and technological innovations. Professional development can take various forms, such as workshops, conferences, online training, mentoring, and collaborative learning groups. By prioritizing the professional growth of teachers, educational institutions can cultivate a talented workforce that contributes to innovation and excellence in the field of education.
- **Celebrate Creativity**: Acknowledge and reward students for their unique ideas and contributions during discussions and assignments. Emphasize examples where students have skillfully integrated information from multiple sources to create original and insightful work.

PARADIGM SHIFT: TRADITIONAL CLASSROOM VS MODERN CLASSROOM (NEP 2020)

Area	**Traditional Classroom (Classic Approach)**	**Modern Classroom (Technology-Enhanced Learning)**
Pedagogy	Teacher- Centric, Lecture-Based Teaching.	Student -Centred, Inquiry-Based, experiential, and Interdisciplinary Learning.
Innovation	Limited or no use of technology in Instructional methods.	Integration of digital tools-learning platforms, and multimedia to Enhance teaching and learning.
Learning Process	Rote memorization with a focus on Theoretical knowledge.	Focus on critical thinking, Creativity, and real-world application through active Involvement.
Assessment	Exam –Centric with emphasis on grades and recall ability.	Holistic Evaluation emphasizing skill, Problem-solving and innovation.

Engagement	Passive learning with minimal Participation.	Interactive and collaborative learning with higher student Participation.
Resources	Reliance on physical textbooks and Traditional tools.	Use of virtual labs, online simulation, AI tools, and blended learning Environment.

CONSTRAINTS IN EXECUTING INNOVATION IN NEP 2020

- A significant challenge in implementing NEP 2020 is the need for improved infrastructure and maintenance, especially in rural areas where schools often lack basic facilities. Essential resources like classrooms, libraries, and clean water are still inadequate, particularly for female students. For the initiative to succeed, a major upgrade to this infrastructure is necessary to support experiential learning and vocational education.
- Teacher training is another critical issue. The policy calls for innovative teaching methods and technology integration, but many educators are not sufficiently prepared to adopt these approaches. Overcoming this gap requires substantial investment in continuous professional development.
- The digital divide further complicates implementation. While NEP 2020 supports digital learning, many rural and economically disadvantaged communities lack internet access and devices, hindering equitable resource distribution in the growing online education landscape.

SOLUTIONS TO PREVAIL CHALLENGES

To address these issues, increased government funding is essential, particularly for underserved regions. Strategic investments in infrastructure, digital tools, and teacher training can help bridge educational gaps. Public-private partnerships can also play a vital role, with private companies collaborating with the government to improve digital access and resources. Cooperation between businesses and universities can help provide skill-based training, aligning education with job market needs.

CONCLUSION

The global marketplace thrives on creativity and innovation. Educators in the 21st century have both civic and academic duties to equip students with the 4 C's by implementing a hybrid teaching approach, which offers a structured and effective way to prepare learners for life as global citizens. In this research paper, I emphasized strategies for enhancing 21st-century skills, particularly the 4 C's, through techno-pedagogical techniques. Integrating technology is essential to achieve high-quality teaching. Contemporary classrooms utilize various technologies, and educators must guide students in critical thinking by fostering advanced thought processes in response to challenging problems. Additionally, it's crucial to instruct students in effective communication skills, focusing on netiquette, and to nurture creativity and innovation through the exploration of different ideas and art forms. Our education system stands at a pivotal moment. We must adapt to the rapid technological advancements and equip students with the 21st-century skills required to thrive as capable global citizens.

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