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Digital Reimagining Early Childhood Education with NEP 2020 From Chalkdust to Touchscreen : An Innovation Begins

Abstract : The nature of education has changed today. In the new education policy, work is being done to improve the quality of this education, increase education, and make the experience of students more attractive. ICT is the beginning of innovation in traditional teaching for children. Today, scientificity is being used in ECI with the aim of practicing new methods in the education of young children, teaching them in new ways, promoting their practice, social and academic development. For this, the use of statistics is more important in the quality of education today. It is not only to achieve the learning ability of children, but it is also important to make the learning ability more effective in teaching. Through this, the learning experience becomes more personal, active, and temporary. Advanced teaching tools for children such as smart classrooms, projectors, and interactive whiteboards are able to create more engaging and easy to understand tools for children. To improve the quality of education by ICT, Dynesis, interactive games, audio-visual materials, and other digital classrooms are being used to make learning more effective in the classroom. Both the government and the private sector are

promoting the extensive use of science to ensure quality early childhood education for all children. Both the government and the private sector are promoting the extensive use of science to ensure quality early childhood education for all children. There are a good number of early kindergarten and private service providers in India like nursery school, kindergarten, play school school in Patna. It is constantly increasing (private service provider). In Bihar, it is not yet fully operational in a transformative form. This is the time when it is necessary for service providers to know how ICT is being used in ECCE to make education more effective, convenient and inclusive and what problems can be faced among these students.The present research was conducted with the lowest students in this context.

Key words: Digital Reimagining, Early Childhood Education, NEP 2020, Innovation Begins.

Introduction : For decades, the foundational stage of education (ages 3-8) has been characterised by traditional teaching methods. The touch of chalk dust, the rustle of paper and the tangibility of physical objects. But today, the education landscape stands at a profound turning point, a transformation driven by the relentless evolution of technology and a sea change in our understanding of how young children learn. **Bhattacharya, M., Mukherjee, P. (2019).** These methods, though time-honoured, now co-exist with a new generation of children born into a digital ecosystem, for whom interactive screens and digital media are not new but natural elements of their world. This convergence of the traditional and the modern presents both an unprecedented challenge and a transformative opportunity for educational structures across the world. In India, this opportunity has been met with a visionary and decisive response: the National Education Policy NEP 2020 is a turning point in Indian education, and its most revolutionary proposals are perhaps most clearly encapsulated in its approach to early childhood care and education (ECCE). The policy not only mandates universalization of quality early childhood education, but also boldly integrates information and communication technology (ICT) into its very core. This integration is not just an additional or supplementary tool; it represents a fundamental “digital reimagining” of pedagogical philosophy, curriculum design, and classroom practice for the youngest learners. The policy moves decisively away from the old, screen-time-centric fear of technology to a philosophy of empowering, considered, and developmentally appropriate use. **Aggarwal. K., Barman, S. (2020).** The use of ICT tools makes learning more engaging for young children. These tools

provide experiential learning opportunities where children explore concepts through play-based activities. The objectives of incorporating ICT in ECCE are to enhance learning experiences. The use of ICT tools such as tablets, educational software, and interactive whiteboards makes learning more engaging for young children. The introduction of ICT in ECCE also poses implementation challenges, which must be addressed. Adequate infrastructure such as internet connectivity and access to devices is essential for effective implementation. Many rural areas still lack basic technological facilities. There are training requirements. Teachers must be adequately trained not only in using technology but also in effectively integrating it into their pedagogical practices. There is a need for high-quality educational content specifically designed for young children that aligns with developmental milestones. It is important to balance screen time with traditional play-based learning; excessive screen exposure can lead to negative health outcomes if not managed properly.

Singh, A., Sharma, R. (2022). NEP 2020: A roadmap for India's education system. Springer.
(A contemporary analysis that explores the implementation pathways and challenges of NEP 2020, including digital components.) ***
Vygotsky, L. S. (1978). Mind in society: The development of higher psychological processes. Harvard University Press.
(Another foundational text, his concepts of the Zone of Proximal Development (ZPD) and social learning are crucial for designing collaborative digital learning tools.)* ***
Chomsky, N., & Lightfoot, D. W. (2002). Syntactic structures (2nd ed.). Mouton de Gruyter.
(A foundational text on language acquisition theory, relevant for discussing Foundational Literacy and Numeracy (FLN) in a digital context.) **
Cope, B., & Kalantzis, M. (Eds.). (2015). A pedagogy of multiliteracies: Learning by design. Palgrave Macmillan.
(Explores modern literacy encompassing digital media, directly supporting NEP's vision for 21st-century skills.)
Hague, C., & Payton, S. (2010). Digital literacy across the curriculum: A futurelab handbook. Futurelab.
(A practical guide on fostering digital literacy, useful for operationalizing NEP's directives.) ***

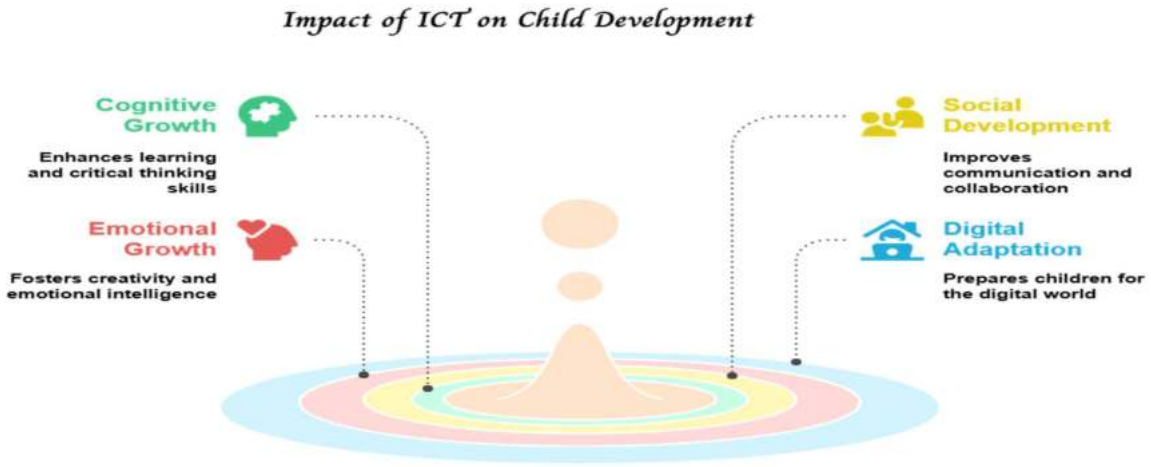


Table: Impact of ICT on Children's Development

Area of Development	Contribution/Impact of ICT
Cognitive Development	Digital puzzles, quizzes and interactive games improve reasoning, problem-solving and creativity.
Linguistic Development	Development Storytelling apps, e-books and audio-visual content improve vocabulary and communication skills.
Social Development	Team-games and collaborative activities develop a sense of sharing, cooperation and teamwork.
Emotional Development	Success in games builds confidence and failure instills patience and the habit of trying again.
Physical (Motor) Development	Touch-screens, drawing tools and interactive apps improve hand-eye coordination and fine motor skills.

This paper posits that the introduction of ICT at the grassroots level by NEP 2020 is not just an upgrade in educational technology but the introduction of a significant innovation, a well-thought-out and necessary development. However, this change is subtle. It does not advocate replacing rich, sensory and human-centred early childhood experiences with passive digital consumption. Instead, it envisions a synergistic mix where technology acts as a catalyst to enhance play-based, discovery-oriented, and inclusive education. It promises tools for personalized learning paths, digital resources to bridge socio-economic gaps, and interactive platforms that make

abstract concepts tangible. **Chaturvedi, A., Sharma, P., Rani, K. (2021).** This paper aims to critically examine this budding innovation. It will explore the theoretical underpinnings of integrating ICT within a constructive and developmentally appropriate ECCE framework supported by NEP 2020. It will analyze the potential of digital tools to promote foundational literacy and numeracy, creative expression, and cognitive development. In addition, the paper will also engage with the critical challenges inherent in this transformation including the digital divide, the urgent need for teacher capacity building, concerns of digital equity, and the imperative to curate high-quality, relevant digital content. By examining these aspects, this research aims to provide a comprehensive initial analysis of whether this policy-driven innovation can truly deliver on its promise to transform India's foundational education landscape, preparing its children not just for school, but for a dynamic and digitally-mediated future.

Objective 1: Enhance skills in NEP 2020-aligned, game-based digital learning.

Hypothesis 1: It is hypothesized that the integration of developmentally popular, interactive digital tools (e.g., storytelling apps, puzzle-based numeracy games) that follow the game-based and activity-focused guidelines of NEP 2020 will lead to statistically significant improvements in the acquisition of core (FLN skills) such as letter recognition, vocabulary building, and number sense compared to traditional, non-digital game-based methods.

(Objective Summary : This objective focuses on the core educational mission of NEP 2020-aligned, play-based digital learning. It is hypothesized that when technology is used correctly as a tool for play and learning, it advances sustainability, wherein learning values can be enhanced.)

Objective 2: To assess the role of structured teacher professional development as a critical mediating factor for the successful implementation of ICT in foundational (ECCE) level classrooms.

Hypothesis 2: It is hypothesized that successful integration of ICT will depend directly on the extent and quality of teacher professional development. Teachers who receive comprehensive training on technological pedagogical content knowledge (TPACK) will exhibit higher self-efficacy, more effective integration of digital tools in teaching, and create more positive and impactful digital learning environments than teachers who only have access to technology without pedagogical support.

(Objective Summary: Addresses the critical human element of this innovation. This research hypothesizes that the mere presence of technology ("touchscreen") is insufficient; its

success depends on the teacher's ability to use it effectively, which requires targeted training.)

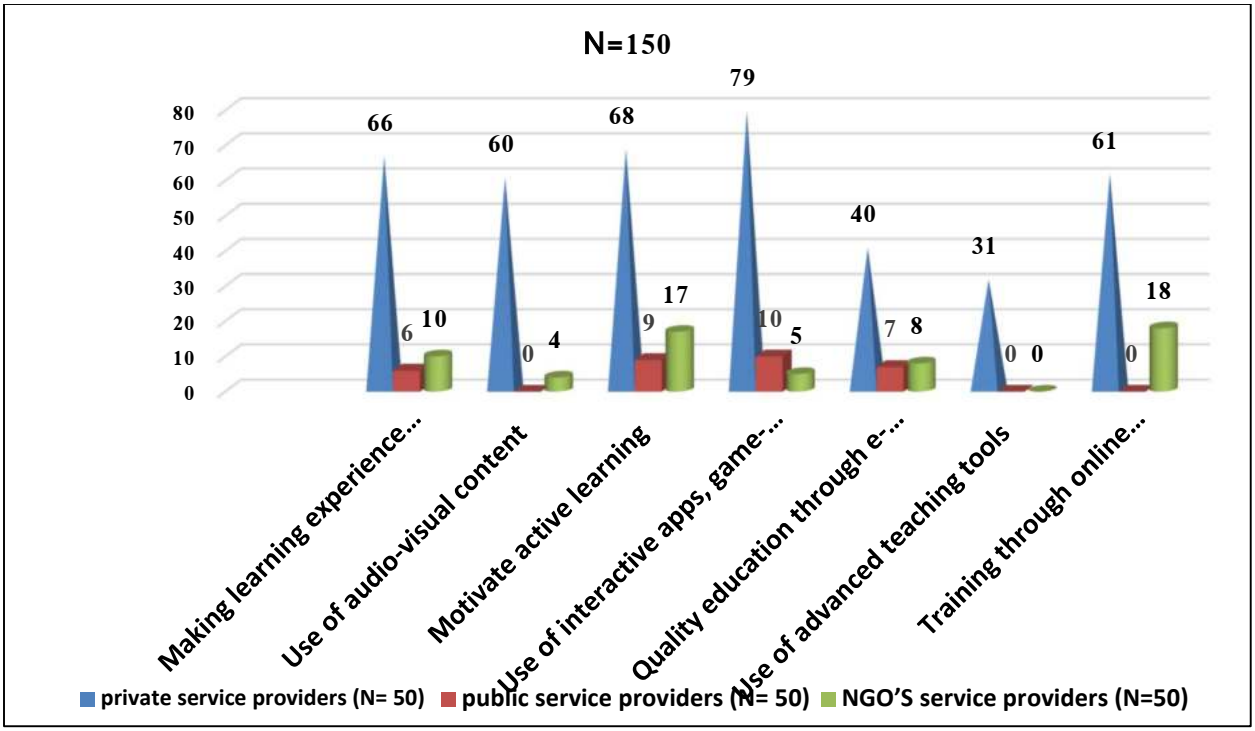
Research Design : This study uses a sequential explanatory mixed-method design. This approach has been chosen to provide a comprehensive understanding of the complex process of integrating ICT in ECCE as mandated by NEP 2020. Phase 1 (**Qualitative):** A quasi-experimental design will be used for learning outcomes in the digital community phase. Phase 2 (**Qualitative):** A multiple case study approach will be used to gain an in-depth understanding of the process of impact, focusing on teacher instruction, introduction, and students. Learning Setting and Environment: This study will combine data from (1) Public Service Provider Respondents (50 students), (2) Private Respondents (50 students), (3) NGOs Student Respondents (50 students), total (150 students) falling under Patna city. Purposefully sampled sample of Anganwadis and Primary (Classes 1-2) areas of the city. **Groups:** Group 1 (students): Around 200 children (pre-primary and Class 1), aged 5-6 years, divided into groups. Group 2 (teachers): 20-25 Anganwadi workers and teachers of the early grades. Group 3 (administrators): 5-6 key resource persons and education officers who will be responsible for the implementation of NEP 2020. Stratified purposive sampling will be used to select teachers and administrators to ensure representation of both Anganwadis and primary schools.

Data Analysis : Data from pre- and post-tests will be analyzed using Statistical Package for Quantitative Data (SPSS version). Descriptive statistics (mean, standard deviation) will be calculated. Inferential statistics, specifically independent sample t-tests and analysis of covariance (ANOVA), will be used.

Table-1- Descriptive Statistics :

Evaluation of the performance of participating ECCE service providers Respondents (private, public and NGO'S)			
Total Number of Participating Respondents (N=150)			
Evaluating the work of user service providers of digital literacy and ICT in ECCE	**private service providers (N= 50)**	**public service providers (N= 50)**	**NGO'S service providers (N=50)**
	%	**%**	**%**
Making learning experience more engaging and interactive	**66**	**6**	**10**

Use of audio-visual content	**60**	**0**	**4**
Motivate active learning	**68**	**9**	**17**
Use of interactive apps, game-based learning activities	**79**	**10**	**5**
Quality education through e-learning platforms	**40**	**7**	**8**
Use of advanced teaching tools	**31**	**0**	**0**
Training through online courses, webinars, and digital content	**61**	**0**	**18**
Improving teaching methods of teachers, training	**60**	**13**	**4**
Sum	**465**	**45**	**66**
Mean	**58.125**	**5.625**	**8.25**
Standard Error	**5.468864795**	**1.802156446**	**2.273685**
Median	**60.5**	**6.5**	**6.5**
mode	**60**	**0**	**4**
Standard Deviation	**15.46828553**	**5.097268176**	**6.430952**
Sample Variance	**239.2678571**	**25.98214286**	**41.35714**
Kurtosis	**0.206186808**	**-1.618351791**	**-0.82987**
Skewness	**-0.788812838**	**-0.011460893**	**0.610712**
Confidence Level(95%)	**12.93181024**	**4.26142281**	**5.37641**



Source: Based on survey

Classification and Analysis of Facts: Audio-Visual Material ICT is used to make education more interesting and engaging for children. Audio-visual material, animations, and educational games keep children interested and make the learning experience fun. The data and facts obtained from the study prove that charts, black boards, game material, audio-visual material were found less than estimated to complete ECCE activities at all the centers of 66% private service providers 10% public service providers and 6% NGO's service providers, due to which all the activities here were not being conducted efficiently. The use of ICT tools like advanced teaching tools, smart classrooms, digital projectors, and interactive whiteboards to complete ECCE activities at all the centers of all these service providers was less than estimated, which was less according to the research. Motivated for active learning The use of ICT motivates children to learn actively. Children learn more effectively through interactive apps, digital puzzles, and game-based learning activities. ICT was being used for active learning by 78% Private Service Providers Public Service Providers 9% NGO'S Service Providers 17%. Accessibility to quality education Quality education can be easily delivered through digital tools

and e-learning platforms. Quality education through e-learning platforms and digital tools were being used by 40% Private Service Providers Public Service Providers 7% NGO'S Service Providers 8%. Capacity building of teachers and improving teaching methods, Training and Development Training and Development The use of digital resources ICT helps teachers to get familiar with modern teaching methods. Training and Development Through online courses, webinars, and digital content, teachers develop their capabilities. 61% of private service providers were training teachers to improve their teaching methods 0% Public service providers 18% NGO's service providers, ICT tools such as advanced teaching tools, smart classrooms, digital projectors, and interactive whiteboards enable teachers to design classes that are more engaging and easy to understand for children. Advanced teaching tools were being used by 79% Private service providers Public service providers 10% NGO's service providers 5%.

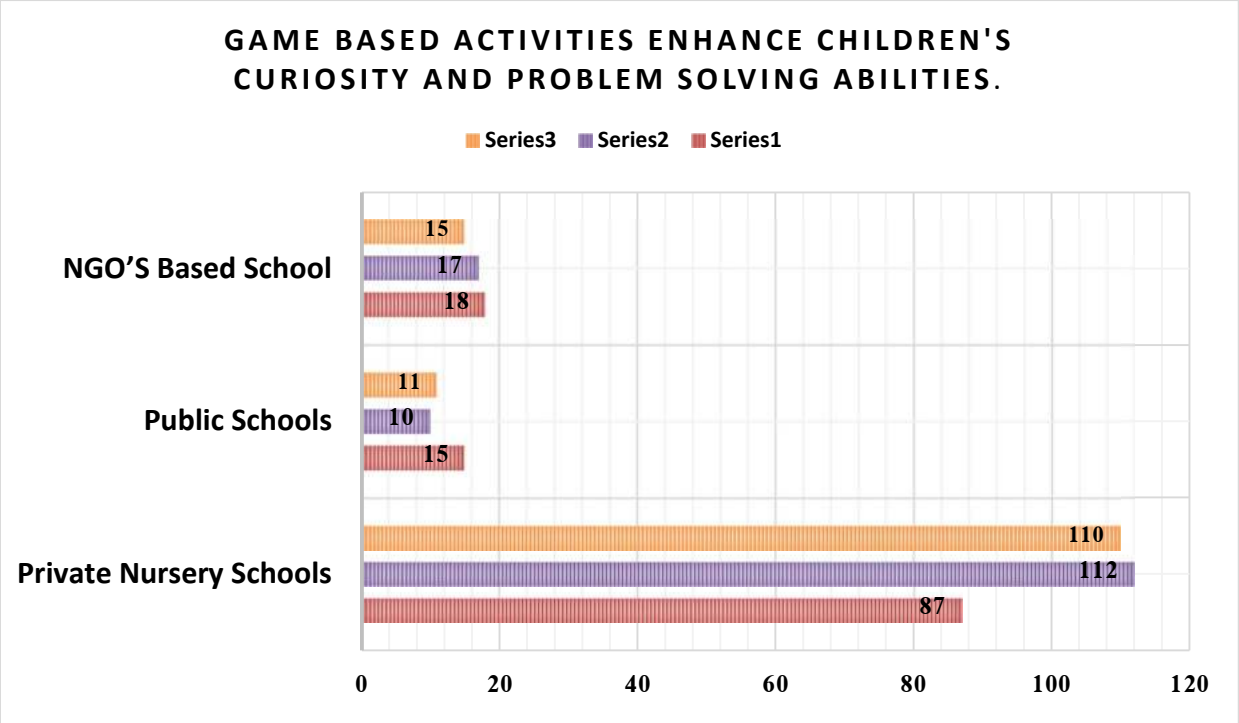
Table-2- Descriptive Statistics: -

Game based activities enhance children's curiosity and problem solving abilities.			
Puzzle Based Learning (PBL)	**Private Nursery Schools**	**Public Schools**	**NGO'S Based School**
Puzzle Based Learning	**87**	**15**	**18**
Self-paced learning)	**112**	**10**	**17**
Game-Based Learning)	**110**	**11**	**15**

N=150	**Game based activities enhance children's curiosity and problem solving abilities.**									
	Main Results (Rounded)		**Variance Results (Rounded**		**T-test (comparison of both groups)**		**F-test (comparison of variance)**			
Private Nursery Schools children	**03.0**	**2.0**	**6.67**	**93.0**	**7.0**	**2.33**	**Private vs Public T= 11.15, p= 0.00037**	**Private vs NGO T= 0.70,**	**Public vs NGO T =-2.65,**	**F= 116.81, p= 0.000016**

's							significant difference	p= 0.00043 significant difference	p= 0.057 o significant difference	here are clearly differences between the three groups.)
Public Schools children's										
NGO'S Based School children's										
Grand Mean	43.89	Overall Variance 2020.11								

Graph-2:- Game based activities enhance children's curiosity and problem solving abilities.



Source: Based on survey

Statistics Data Analyse:- The acceptance and effectiveness of Puzzle Based Learning and Game-Based Learning is very high in Private Nursery Schools while it is very low in Public Schools and NGO Schools. Highly significant difference was found in Private vs Public and Private vs NGO. There is no significant difference between Public and NGO ($p \approx 0.057$). ANOVA $F= 116.81$, $p= 0.000016$ also proves that the learning patterns and impact of ICT-based activities are different in all three groups. The conclusion is that Private Nursery Schools are implementing puzzle and game-based learning most effectively to enhance curiosity and problem-solving skills in children.

- **Hypotheses 1,** (It is hypothesized that the integration of developmentally popular interactive digital tools (e.g., storytelling apps, puzzle-based numeracy games) that follow the game-based and activity-focused guidelines of NEP 2020 will lead to statistically significant improvements in the acquisition of core (FLN) skills such as letter recognition, vocabulary building, and number sense compared to traditional, non-digital game-based methods) and **Hypothesis 2,** (It is hypothesized that the successful integration of ICT will be directly dependent on the extent and quality of teacher professional development. Teachers who receive extensive training on Technological Pedagogical Content Knowledge (TPAK) will exhibit higher self-efficacy, more effectively integrate digital tools in teaching, and create more positive and impactful digital learning environments than teachers who only have access to technology without pedagogical support) are found to be supported by the statistical data.

Results and Discussions:- The implementation of ICT in ECCE is expected to yield several positive outcomes. First, it can facilitate personalized learning experiences tailored to the needs of individual children, which is expected to yield positive outcomes in line with how they learn at their own pace. Secondly, access to digital resources can enrich the curriculum by providing a wide range of content that supports various subjects such as language development, mathematics, science, and the arts. Additionally, incorporating technology can enhance teacher training by providing teachers with innovative tools and methodologies for effective instruction. However, challenges remain with regard to infrastructure, teacher training, and equitable access to technology. Ensuring that all children have access to quality ICT resources is critical to the success of this initiative. Furthermore, teachers must be adequately trained not only in using technology but also in effectively integrating it into their teaching practices.

Conclusion: The introduction of ICT in

ECCE as per NEP 2020 represents a significant shift towards the modernization of early childhood education in India. It acknowledges that technology plays a vital role in enhancing pedagogical practices and improving educational outcomes. By integrating ICT into early learning environments, teachers can provide interactive and engaging learning experiences that cater to different learning styles. Furthermore, this initiative is in line with global trends in education where technology is increasingly being recognized as an essential component of effective teaching and learning.

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Significance of Findings: The findings of this research on digital reimagining of early childhood education (ECCE) guided by National Education Policy (NEP) 2020 have significant implications for various stakeholders of the startup ecosystem in India and internationally. The findings of the study will provide benchmarks and guidelines going forward beyond mere scientific interest.

1. Classical Significance: This research is anchored in modern scientific theory by presenting empirical findings on how digital tools can be effectively leveraged for creative and play-based learning. **Development of TPA Framework:** The findings will provide a nuanced understanding of the Technology Scientific Content Knowledge (TPAK) framework, especially in the low-resource, high-capacity context of Indian ECCE. It involves the specialized scientists required to develop "technological guides" (teachers) to enrich this archaic model for the early childhood environment.

2. Practical and Policy Significance: This study aims to serve as an important theory-based resource for policy at the national and state levels (e.g., NCE Retail, SCE Rate). The findings directly impact the development of: Developing clear, practical frameworks for selecting and integrating digital tools that are truly developmentally appropriate. Teacher Training Modules: Designing effective professional development programs that focus on pedagogical integration beyond digital models, which scales with the

teaching capacity building thrust of the NIP. Source Materials: Providing data to guide investments in templates, content development and support, ensuring that funds are used effectively. A Compendium of Institutional Data: For Anganwadi and early grades, this research validates their critical role and provides a collection of evidenced data. By identifying common examples and successful models, it can promote the objectives of the study and provide a much-needed roadmap for transitioning from a traditional to a digitally-assisted learning facilitator. It claims that what it calls "high-quality, curated" digital content promotes active electronics rather than passive consumers, more effectively and pedagogically guiding the development of the learning institution.

3. Future Preparation: This research points to the importance of introducing digital design and computer thinking early, not as a separate subject, but as a skill. By doing so, it aims to prepare a generation of learners to become objective, critical, and enthusiastic users of technology, and equip them with the 21st century skills they need to thrive in a rapidly evolving digital world.

Recommendations: To make the digital reimagination of early childhood education under NEP 2020 effective and equitable, the following actions are recommended:

- **Make pedagogical training compulsory, not just technical:** Teacher professional development should move beyond basic digital literacy, to focus on integrating technology into play-based learning (TPAK framework).
- **Establish a quality-control framework for digital content:** Develop and implement clear guidelines for "developmentally appropriate" digital content that is interactive, relevant, and promotes active creation rather than passive consumption.
- **Adopt a phased, equity-first implementation model:** Prioritize providing the necessary infrastructure (devices, electricity, internet) in disadvantaged areas first to prevent the digital divide from widening.

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