



Shaping The Digital Campus: The Transformative Aspects Of Artificial Intelligence, Augmented Reality And Virtual Reality On Higher Education In India

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Abstract

The rapid advancement of Artificial Intelligence (AI), Augmented Reality (AR) and Virtual Reality (VR) are changing the dynamics of higher education system in India. This paper aims to study the transformative aspects of AI, AR and VR on Indian Higher Education institutions (HEIs) vis-a-vis challenges concerning their use within the scope of the National Education Policy (NEP) 2020 and the solutions that have been proposed to facilitate their adoption in education. Using a theoretical approach, this study tries to investigate existing literature, expert perspectives and relevant pointers regarding these technologies in India's higher education system. The study sheds light on the evolving role of technologies like AI, AR and VR in digital campuses and the ability to foster learning environments that are more personalized and engaging. This research may enable the educational system of India to meet the aims outlined in NEP 2020 for creating a more inclusive, innovative educational ecosystem.

Keywords: Digital campus, Artificial Intelligence, Augmented Reality, Virtual Reality, Higher Education System, NEP 2020

1. Introduction:

Innovations and advancements have provided new avenues for higher learning. With the aid of technology, education has become easier and more accessible through online courses. The ongoing aid of technology is essential in enabling the teaching and learning process through tools that assist the students. Digital tools can effectively replace traditional methodologies as long as there is a solid pedagogical framework in place. More investigations have to be conducted to find out if these techniques are truly supporting new learning methodologies or just repeating older styles. Online institutions have employed a lot of digital tools to help learners who are hindered by location, work and family. New emerging technologies in education have been bound to grow due to COVID-19 and the subsequent changes in teaching and learning have greatly diversified. The future of these changes in the post-pandemic era remains uncertain. AI, AR, and VR technologies play an important role in fostering active, constructive, and creative learning. These new technologies assist in the teaching as well as instruction and can be used on mobile devices to address the specific needs of the learners.

- **Digital Campus:**

India is integrating new technology initiatives into its educational institutions. Every nation around the world is experiencing a transformation in the education sector due to technology and India has also been predetermined. With a growing population, Indian Higher Educational Institutions (HEIs) are embracing technology in order to resolve issues like infrastructure, geography, and learning inclusivity. A 'Digital Campus' utilizes several online platforms, AI, AR, VR, and data analytics to improve teaching, learning and administrative processes.

Today in India, the ideology of providing education is changing. Learning is becoming more technology intensive and sophisticated. The students of today, walk into lectures differently and interact with the material taught in an innovative approach. The emergence of Digital Campuses enhances not just the operation of academic institutions, but also the interaction of students with their peers and educational resources.

- **Artificial Intelligence in Education:**

The term AI was first coined by John McCarthy in the 1950s when he sought to develop computers that could think and perform tasks at a human level. Artificial intelligence (AI) refers to the ability of computer systems or other machines enabled by IT to perform tasks that would require human reasoning and intelligence. Although AI has the power to bring positive changes to the world, it also poses certain problems of its own (Siau, 2018).

AI will influence the landscape of higher learning institutions especially on matters curriculum and student enrollment. It will enhance some areas that require speed and precision but lack soft skills such as communication and creative thinking. Universities should have a balance between technical subjects and the social sciences. Some offer AI classes to business students, and there is a possibility that enrollment will shift to Arts while the accounting subjects may drop. It may also cut down expenses and bring in AI teaching assistants (Ma & Siau, 2018). In higher education, there is an increasing use of AI tools such as Accessibility, Plagiarism detection systems, and Exam generative software. These 'smart' tools help analyse student data, flag those who require extra help, and develop individualized learning plans which subsequently improve learning results.

- **Augmented Reality in Education:**

Caudell and Mizell (1992) defined Augmented Reality (AR) as a technology that expands the user's view by overlaying information that assists in performing a task. Feiner further elaborated AR in 2002 as a technology that blends virtual information with one's environment's sensory perception with the assistance of a computer (Feiner, 2002).

Augmented Reality (AR) blends digital visuals with the physical environment to offer interactive learning experiences. As noted from the findings of Chen et al. (2020), AR can serve to increase motivational and academic performance of students in learning. Students taught through AR showed better interaction and analysis of content. Moreover, as pointed out by Sun (2022), AR allows students to personalize their learning experiences to be at their own learning speed, the effectiveness rationale to enhance engagement is elementary.

- **Virtual Reality in Education:**

Virtual Reality (VR) is the latest technology which integrates information, computer graphics, and electronics to fully immerse a user into a unique experience that makes him feel as if he is in a fully interactive computer simulated environment. VR can also be referred to as a case where users are completely encompassed in a responsive virtual environment that allows them to control their perspective in real-time (Brooks, 1999).

VR, which stands for Virtual Reality, aims to create an artificially constructed environment that seeks to replicate the real-world through computer graphics. In education, VR has been used to create immersive learning opportunities. Akcayir & Akcayir (2017) conducted research and illustrated how VR, significantly affected student engagement and their learning outcomes. Students placed in a VR learning environment were more engaged with the material and appeared to understand the subject at a deeper level. Additionally, VR offers a safe space for students to learn from their mistakes without facing real-world consequences, as noted by Patete & Marquez (2022).

2.Objective of the study:

1. To study the transformative aspects of AI, AR and VR on Indian higher educations (HEIs), in alignment with the National Education Policy (NEP) 2020.
2. To identify the challenges faced by Indian HEIs in the implementation of AI, AR and VR technologies in education.
3. To explore potential opportunities and solutions to facilitate the adoption of AI, AR and VR in education.

3.Literature Review:

Daga et al. (2023) in their paper “**Future of AR & VR in Indian education system**”, examined the role of Augmented Reality and Virtual Reality in transforming India’s education system, reviewing its impact in western countries and its potentiality in India. The study adopted a descriptive approach and literature review techniques. It critiqued traditional rote learning methods and argued that AR could enhance engagement and bridge the gap between theory and practice.

Deep and Kumar (2023) conducted a study on “**NEP-2020 and technology enabled learning: A step towards coordinating relevance and excellence in Indian higher education**”. This study explored the integration of technology in higher education under NEP 2020, focusing on digital resources, student centered learning and teacher training. The researchers employed a qualitative and descriptive approach. While highlighted the potential benefits, the study also identified challenges such as inadequate infrastructure and the need for faculty development to ensure successful implementation.

Enayathulla and Krishna (2024) worked on “**The role of artificial intelligence on higher education in India and its adoption in higher education institutions**”. This paper looked at AI’s role in higher education in India and employed a systematic review approach, analysing existing researches. The results highlighted AI’s ability to personalize learning and improve administrative efficiency, while also addressing concerns about data privacy and biases, urging further investigation into ethical implications and AI adoption in education.

Gajjar (2024) carried out a study titled “**Artificial intelligence, machine learning, augmented reality and virtual reality in school education: Transforming future of learning**”. This paper explored the role of emerging technologies like AI, machine learning, AR, and VR in K-12 education. The study used a qualitative approach, reviewing literature and case studies etc. It emphasized the potential of these technologies to improve learning experiences and teacher student interactions and also highlighted challenges such as infrastructure limitations and teacher training needs.

Manjula (2024) conducted a study on “**Artificial intelligence and higher education in India: A sociological analysis**”. The study analysed the impact of AI on higher education in India and used a descriptive approach. The results highlighted AI’s potential to personalizing learning, improving administrative tasks and supporting tutoring systems. While noting concerns about privacy, biases and misinformation and the need for careful management of AI adoption.

Rajapandian et al. (2024) in their paper titled “**Augmented reality and virtual reality: Transforming the future education**”, focused on AR and VR’s transformative role in education, examining their impact on engagement, creativity and critical thinking. The study employed reviewing existing literatures, articles etc. Despite challenges like cost and accessibility, the Results stressed the potential of these technologies to enhance learning.

4.Methodology:

Our approach followed a theoretical framework and qualitative perspective. We conducted a thorough review of existing literature, expert opinion and emerging trends to understand the evolution, challenges and future potential of engaging technologies like artificial intelligence (AI), Augmented reality (AR) and Virtual reality (VR).

5.Ethical Consideration:

This paper used publicly available records from various institutions, such as research papers, websites, articles etc. No ethical permission was required because the investigation used publicly available records.

6. Discussion and Findings of the study:

Objective 1: To study the transformative aspects of AI, AR, and VR on Indian higher education institutions (HEIs), in alignment with the National Education Policy (NEP) 2020.

Discussion 1: The Contribution of AI, AR, and VR in Transforming Indian Higher Education Institutions in Accordance with NEP 2020.

- **AI in Education: Indian Perspectives and Applications in the Context of NEP 2020:**

- **Individualized Learning:**

Artificial intelligence (AI) facilitates personalized education by modifying learning material to meet specific student requirements. In compliance with the emphasis on equity and inclusion outlined in the NEP 2020, AI-enabled systems are being utilized in Indian higher education for monitoring progress and providing guidance to users in urban and rural areas alike.

- **Assessment and Analytics:**

This technology enables real-time evaluation of performance, which is crucial for educators to monitor the progress of learners and ascertain who is most vulnerable. In line with NEP 2020's principle of competency-based education, these AI technologies help educators customize their teaching strategies and provide necessary forms of assistance on time, while teachers are relieved from excessive work by AI technology-based marking systems.

- **Intelligent Tutoring Systems (ITS):**

It driven learners' support systems enhance learning support with tailored help, improving the overall experience. Indian HEIs use platforms like Carnegie Learning for students to complete interactive exercises and receive instant feedback and self-paced learning to mitigate the issue of teacher shortages in some places.

- **Administrative Automation:**

AI systems decrease the burden placed on educational institutions by automating administrative processes such as scheduling, allocating resources, and communication. This is supportive of NEP 2020 by enhancing the efficiency of institutions, and as a result, more effective resource management and communication is achieved within HEIs.

The application of AI in Indian higher education, consistent with NEP 2020, aims at raising the standard of teaching, the effectiveness of learners, and removing barriers to participation.

Table 1: The list of AI tools in higher education institutions (HEIs) in India:

AI Tool	Purpose
CleverTap	AI-powered engagement and retention, personalized content, and automated communication.
Coursera	AI-based course recommendations based on user behavior and performance.
Socrative	AI tool for formative assessments and real-time feedback on student progress.
Moodle with AI Plugins	AI-integrated LMS for analytics, assessments, and performance feedback.
Quizlet	AI-powered flashcards for exam preparation, personalized study sets.
Turnitin	AI-powered plagiarism detection for academic integrity and feedback.
Google Classroom with AI Integration	AI-powered LMS for managing coursework, assignments, and assessments.

▪ **AR in Education: Indian Perspectives and Applications in the Context of NEP 2020:**

• **Field Trips and Simulations programme:**

Enhanced immersion in educational activities is achieved through AR presented in virtual tours, field trips, or simulations. It serves the purpose of experiential learning set out in NEP 2020 by ensuring that Indian students, even from distant regions, have access to virtual views of important historical places and global geography.

• **STEM Education:**

In STEM education, AR is especially useful since students can participate in activities that would otherwise be very difficult to carry out. It increases the engagement of Indian students and helps them better understand the material. It puts into practice NEP 2020's call for increased engagement in STEM activities within Indian HEIs by using virtual labs and simulations.

• **Interactive Textbooks and Learning Materials:**

These features are enhanced by AR integrated into videos or 3D models allowing the students' engagement to be improved. In addition, AR technology helps in the implementation of NEP 2020's innovative learning approach. Within Indian HEIs, AR helps students in understanding 3D models better, especially for those who study biology.

• **Language Learning:**

Students are able to comprehend vocabulary easier and remember it longer because language learning is made intense through AR associating words with relevant real-life materials and surroundings. AR, in a multilingual country like India, helps in promoting multilingualism and makes learning languages easy.

Augmented Reality usage in these areas for higher education in India effectively meets the requirements of NEP 2020 in changing the pedagogy used, improving learning results, and increasing engagement in the classroom to make the environment more inclusive.

Table 2: The list of AR tools in higher education institutions (HEIs) in India

AR Tool	Purpose
Merge Cube	AR tool that allows students to interact with 3D models for immersive learning in subjects like biology, chemistry, and astronomy.
Google Expeditions	Provides immersive AR experiences, enabling students to take virtual field trips and explore 3D models of historical and scientific concepts.
zSpace	AR platform used to create immersive learning experiences in subjects like STEM, healthcare, and design through virtual labs and simulations.
ARIS (Augmented Reality for Interactive Storytelling)	Tool for creating location-based, interactive AR experiences for education, allowing users to design their own AR learning games and experiences.
Microsoft HoloLens	AR headsets that provide a mixed-reality experience for students and faculty in fields like medical education, engineering, and design.
AR Lab by Tata Elxsi	A platform for creating and experimenting with AR-based learning tools, used in research and development in Indian universities.

▪ **VR in Education: Indian Perspectives and Applications in the Context of NEP 2020.**

• **Special Education:**

Virtual Reality (VR) provides tailored learning experiences for special need children, for example, those who are autistic or have anxiety, as it conforms to the inclusive education practice required by NEP 2020. In Indian HEIs, VR helps such students learn social interactions and coping skills in a safe environment.

- **Engaging Learning Experiences:**

This technology makes it possible to create compelling environments where students can engage with the content of study, such as historical happenings or scientific activities, which aligns with the second pillar of NEP 2020 which focuses on experience and learning. In Indian HEIs, V R aids in the teaching and understanding of sophisticated branches of history and science for deeper learning.

- **Virtual Labs and Simulation of Experiments:**

VR enables learners to perform experiments in a virtual setting without risk, especially in chemistry and physics, which is in line with NEP 2020's objective of improving STEM education through practice. It also allows learners to gain some degree of technical skills and understand difficult and expensive concepts that are virtually impossible in the traditional setting.

- **Greater Collaboration:**

With VR, collaboration is enhanced as students can interact with one another in virtual environments to exchange information and materials instantaneously, in support of NEP 2020 principles of teamwork and classrooms without walls. Better still, it links learners in rural areas facilitating inclusive education.

By Incorporating Virtual Reality, Indian HEIs will be able to foster more captivating, inclusiveness and interactivity in the education system, ensuring compliance to NEP 2020.

Table 3: The list of VR tools in higher education institutions (HEIs) in India

VR Tool	Purpose
Oculus Rift	VR headset used to create immersive learning experiences for subjects like engineering, medicine, and architecture, offering hands-on simulations and virtual labs.
Google Cardboard	Affordable VR platform used in education to create simple and immersive 360-degree content, enabling virtual field trips, simulations, and interactive learning.
Labster	VR-based platform providing virtual science labs for subjects like biology, chemistry, and physics, allowing students to conduct experiments in a safe virtual environment.
VirBELA	A virtual campus platform for creating a fully immersive online campus experience, including meetings, classes, and events, used for remote learning and collaboration in Indian universities.
Virtual Reality Lab (V-Lab)	Virtual reality-based lab used by Indian institutions to create interactive learning experiences in subjects like physics, chemistry, and engineering.
EON Reality	VR and AR platform used to create virtual learning environments for various subjects, including engineering, medicine, and architecture, to enhance learning with interactive simulations.

❖ **Finding 1:**

The main points of the above passage encapsulate how AI, AR and VR are infused in education in India, in accordance with NEP 2020 goals:

- To promote equity and inclusion, AI personalizes lessons by tailoring materials to specific student requirements, and at the same time enables real-time tracking of performance. AI's real-time performance tracking ensures that the teacher's burden is reducing, and teaching and learning processes are more effective. Automated grading and assessment systems increase the educator's efficiency and contribute to competency-based education.
- Through simulations and virtual field trips, AR makes it possible for students to experience and learn from a multitude of places, practicing education-based skills without restrictions, and making it easier for

students who live in isolated regions. It helps in enhancing STEM as well as understanding complex learning materials through the interactive learning process.

- Using VR, special needs students can learn in very specific learning environments and in highly engaging ways. They can work with science and history in exceptionally captivating ways. Additionally, students in other regions can work together, making education more inclusive while eroding geographical boundaries.

These technologies meet the aims of NEP 2020 to make education in India more inclusive, engaging, and useful to students.

❖ **Objective 2: To identify the challenges faced by Indian HEIs in the implementation of AI, AR and VR technologies in education.**

❖ **Discussion 2: Key Challenges in the Adoption of AI, AR and VR Technologies in Indian HEIs: Findings and Insights.**

▪ **Challenges and Considerations in Implementing AI in Indian HEIs:**

• **Teacher Development:**

Teachers and educators need to be trained well so they can efficiently utilize AI in their teaching. Most teachers are not professionally trained to use and employ AI tools, thus making it harder to incorporate technology into their instruction. In order to achieve the desired learning results with AI, teachers must be continuously trained.

• **Data security and privacy:**

Privacy concerns stemmed from the fact that the AI systems of education require highly sensitive student information. Creating measures for preventing personal data misuse is a necessity.

• **Algorithmic Bias:**

Most AI models are created with the expectation that there will be diverse datasets. As a result, biases are introduced if the data utilized for training was not as inclusive. This complicates an AI-based education system's equity.

• **Ethical Issues:**

There are many ethical problems such as the justification of a teacher's role in the classroom being replaced by AI, who is accountable for the actions of the AI, and how algorithms make decisions. As with other technologies, institutions must determine policies on how to ethically implement AI tools.

• **Compatibility with Current Systems:**

Adoption into existing frameworks is often expensive and very difficult. Due to the absence of necessary digital systems in several institutions, a lot of thought-out planning needs to be executed along with gradual integration to help ease use and reduce disturbances.

▪ **Challenges and Considerations in Implementing AR in Indian HEIs:**

• **Cost of Hardware:**

AR use in education calls for specialized equipment such as AR glasses, tablets, or smartphones, which can be expensive and difficult to acquire in remote or underserved regions of India. This can hamper the integration of AR in higher education.

• **Digital Literacy:**

Proper AR application requires accompanying training to the educators. Moreover, many teachers in India are not very well trained so without adequate training, AR would not bring much value. Rather, continuous trainings are important to design impactful AR learning environments.

• **Sustenance and Troubleshoot:**

Supporting and troubleshooting AR technologies requires constant attention and assistance. Institutional issues such as management of hardware and software often challenges AR devices adoption in the long run. For these devices to function, focused IT personnel and avoidable downtimes with constant upgrades are needed.

• **AR Content Creation:**

The criteria for creating effective AR content around any local subject matter and syllabus is often complex and requires the use of specialized languages. More suitable and varied materials can be made available by partnering AR content creators, universities, and technology companies.

▪ **Challenges and Considerations in Implementing VR in Indian HEIs:**

• **Cost Bundle:**

The purchase and charge of supporting computers and headsets is considerable, making it difficult for even slightly resourceful Indian higher education institutions to afford them. Limited scope and maintainable VR equipment is one of the major obstacles to education using AR/VR in developing nations.

• **Physical and Psychological Effects:**

Students using VR for prolonged durations is usually accompanied by discomfort such as eye strain or motion sickness, which can reduce participant engagement and effectiveness. Understanding some of the possible psychological effects is equally important for the student's psychological health while using VR.

• **Space Requirements:**

VR systems demand a specific area for students to effectively interact with the tools, which can be a problem for schools with inadequate or over-crowded classrooms. Effective delivery of VR technology requires adequate space for the students, and that may be a concern in some institutions.

• **Scalability:**

The high value and particular space needs make scaling VR within departments or institutions very difficult. The situation can be improved by a modular approach with shared VR labs or mobile units that make VR more accessible in undersupplied settings.

• **Integration with Curriculum:**

Not all subjects are amenable to having elements implemented into their curriculum, making the introduction of VR into the syllabus rather difficult. Teachers, alongside with students, will need to be taught how to restructure ordinary lesson into active immersive VR lesson which requires the input of specialists in the field of VR who can plan the lessons in collaboration with teachers from different subjects.

❖ **Finding 2:**

There are many issues that come with the implementation of AI, AR, and VR in Indian Higher Education Institutions (HEIs). Lack of teacher training, problems with data privacy, deep-rooted biases, and ethical undertones surrounding AI computing make this integration difficult. While AR's ongoing support and tailored content are aplenty, gaps in digital literacy and high costs of hardware also restrict the potential. The primary concern with VR is all the physical discomfort coupled with the high monetary cost, requirement of a spacious environment, and the impossibility of scaling it up. The obstacles to successful execution can be solved through investment in teacher training, school facilities, course content, and collaboration with specialists.

❖ **Objective 3: To explore potential opportunities and solutions to facilitate the adoption of AI, AR and VR in education.**

❖ **Discussion 3: Exploring Opportunities and Solutions for the Adoption of AI, AR, and VR in Education.**

In this paper, the challenge of including and adopting AI, AR, and VR technologies in the educational sector is approached by looking for the possibility of solving them. They are as follows-

▪ **Opportunities and solution for adoption of AI:**

• **Professional Development for Teachers:**

AI and tech integration is quite popular today hence, continuous workshops and seminars should be held. This would put teachers in a better position to learn and incorporate the best practices. They will learn how to practically use AI. EdTech firms and peer learning sheds aid collaboration as well.

• **Data Privacy and Security:**

Universities must create and implement detailed data security policies based on national laws. Techniques such as Differential privacy must also be employed. To retain trust among students, privacy clauses, in addition to informed consent, need to be surveyed alongside regular audits of AI usage.

• **Mitigating Bias in AI Systems:**

AI systems that incorporate machine learning algorithms should focus on comprehensive datasets with an aim to reduce bias. Partnerships between developers and institutions are also needed to ensure fair comprehensive bias audits targeting specific areas. AI's use of transparency must also be a focal point in

education. In such a case, teachers and students will understand AI's actions and address unreasonable biases.

- **Develop an Ethical AI Framework:**

AI frameworks must be established to monitor and ensure teachers and students use it legally and ethically, preventing the loss of accountability of the AI's actions. Task automation, usage of AI as a learning assistant, and the customization of teachings need to take primary focus instead. Responsibility clauses must be established in the integration of curricula ethics, privacy, and AI policy fair use.

- **Gradual AI Integration and Infrastructure Support:**

Implement AI integration by parts starting with testing and growing to larger scales as required. Work with both hardware and software vendors to tailor their solutions, build out new hardware infrastructure and train IT staff in effective self-management.

- **Opportunities and solution for adoption of AR:**

- **Improving AR Infrastructure and Accessibility:**

In order to improve the adoption of AR, governments and other industry players should invest further in AR enabling technologies and infrastructure, especially in rural areas. Private companies can use these public funding to increase the number of available AR glasses and other necessary tools together with required internet and cloud access.

- **Training and Capacity Building for Educators:**

Continuous professional development programs for educators should be implemented, focusing on AR technology and its application in education.

- **Sustaining AR Systems:**

It is the high education institution's responsibility to provide a specialized IT support unit to take care of the administration and user support of all AR education systems at their school. Provision for systems support should include tasks for maintenance of ongoing active use within the education system, system updates and modification, and user helpdesk functions.

- **Collaborations for AR Content Creation:**

Universities, technology firms and AR content developers should work together to create locally relevant AR content that is syllable based, thus allowing better access for students and teachers of different subjects.

- **Opportunities and solution for adoption of VR:**

- **Collaborative Funding and Resource Sharing for VR Adoption:**

The government together with technology companies should offer subventions, scholarships, and loans for VR equipment while institutions should also be able to use open-source applications, communal VR workstations, and business sponsorships to decrease expenditure and increase accessibility.

- **Managing Physical and Psychological Effects of VR:**

Institutions need to adopt policies that limit the length of VR sessions, promote taking respite sessions, and offer medical support including provide psychological counselling. Ergonomic headsets offered with adjustable settings can enhance comfort and reduce ergonomic strain.

- **Flexible VR Space Solutions:**

Schools can adopt VR units that are modular or portable, allowing teachers quick and easy use of the kits in various learning environments. Additionally, these kits can be put up in multipurpose classrooms and larger spaces to conduct immersive VR sessions.

- **Shared and Phased VR Implementation:**

Universities should build one central Virtual Reality hub for all departments to use, work with nearby schools to share facilities and resources and adopt VR technology over time, top-heavy, with cost-effectiveness and spatial constraints in mind.

- **Faculty Training and Cross-Department Collaboration for VR Integration:**

Universities ought to train staff members on using VR in lessons, foster interdisciplinary work, and conduct preliminary trials of VR in some of the classes to measure its impact. Collaboration with creators of immersive content can be used to design the targeted experiences.

❖ Finding 3:

Considering the integration of AI, AR, and VR in Indian Higher Education Institutions (HEIs) poses several opportunities. With AI, continuous teacher training, effective data privacy measures, and the employment of various datasets to reduce bias are essential. A phased approach with strong IT backing to AI adoption is prudent. In AR, educator training, rural infrastructure investment, and working with content developers are important. For VR, reducing costs through collaborative investment and shared VR workstations is helpful while the physical and psychological coping is done through policy and ergonomic support. Key for smooth VR integration is flexible VR devices and faculty training. In summary, for effective learning, policymakers and educators need to act collaboratively, invest in infrastructure, and develop teachers as the findings reveal that overcoming challenges in AI, AR, and VR requires collaboration and investment

7. Conclusion:

The adoption of AI, AR and VR technologies into Indian higher education institutions (HEIs) exceeds the promise set forth in the National Education Policy (NEP) 2020. AI can further facilitate personalized learning experiences and more robust assessment methods while automating administrative functions. Whereas AR and VR provide novel formats of capturing student's attention through interactive and immersive learning.

However, the large-scale integration of these technologies is impeded by high cost, lack of adequate basic infrastructure, data privacy concerns, inadequate training for faculty and other issues. To meet these requirements, HEIs will have to shift their focus towards higher digital infrastructure as well as update the curriculum and train the faculty.

Moreover, developing partnerships between academia and industry, creating long-term funding opportunities and securing government aid are imperative for proper implementation of AI, AR and VR technologies. In resolving these hurdles and utilizing opportunities available, Indian HEIs will be able to develop an education system that is more inclusive, accessible and forward looking.

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