



USING AI TO SUPPORT SPECIAL NEEDS EDUCATION IN PRE-PRIMARY CLASSROOMS

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Abstract: This paper explores the integration of Artificial Intelligence (AI) in pre-primary classrooms to support children with special educational needs, focusing on inclusive learning, early intervention, and personalized instruction. AI technologies such as speech recognition, emotion-detection systems, and adaptive learning platforms offer new possibilities for addressing developmental delays, speech and language disorders, and neurodiverse conditions such as autism spectrum disorder. These tools not only assist educators in identifying and supporting individual needs early but also enhance engagement and communication among learners. Drawing from current studies and real-world applications, this paper evaluates how AI can serve as an inclusive educational tool while addressing concerns about accessibility, teacher training, and ethical use. In the context of India's growing focus on inclusive and equitable education, integrating AI into early childhood education offers transformative potential in ensuring that no child is left behind. This approach not only fosters cognitive and emotional growth in children with special needs but also strengthens the foundation for lifelong learning.

Keywords: Artificial Intelligence, special education, pre-primary classrooms, inclusive education, early intervention, adaptive learning, speech recognition.

Introduction

What defines the quality of education in a society? Is it the infrastructure and curriculum, or is there something deeper—perhaps the ability to recognize and nurture the unique needs and abilities of every child? Education, in its truest sense, should reflect the values of inclusivity, empathy, and equity, ensuring that no child is left behind. Yet, for many children with special needs, especially in pre-primary settings, access to timely support and personalized learning continues to be a challenge.

Inclusive education is a vision where all children, regardless of their abilities, learn and grow together in a shared environment. In this context, technology—especially Artificial Intelligence (AI)—has emerged as a transformative force. AI, often associated with automation and efficiency, has now taken on a more human-centered role: that of assisting educators, personalizing learning, and supporting children with diverse developmental

needs. AI tools today can track learning progress, recognize speech patterns, interpret emotions, and adapt content to suit the learning pace and style of individual children. These innovations are not only redefining pedagogy but also opening new doors for early intervention and inclusive learning.

Education in the early years is foundational, shaping the cognitive, social, and emotional development of a child. According to educational theorists like Vygotsky and Piaget, these years are critical for language development, socio-emotional learning, and building confidence. When these areas are compromised by developmental delays, speech impairments, or neurodiverse conditions like autism, early intervention becomes essential. AI, when thoughtfully integrated, can act as a supportive tool that complements the educator's role in identifying challenges and designing appropriate responses.

India's National Education Policy 2020 emphasizes the importance of inclusive and equitable education for all learners, including children with special needs. It calls for the use of modern technologies and digital tools to bridge educational gaps and empower teachers. In pre-primary classrooms, where attention spans are short and developmental differences are significant, AI can offer solutions that are timely, personalized, and non-intrusive. These include tools like emotion-sensitive robots, AI-powered speech therapy apps, interactive learning platforms, and visual storytelling tools that can adapt to a child's preferences and pace.

However, the introduction of AI in early childhood education must be approached with caution and care. Technology must not replace human interaction, which is central to a child's emotional and social development. Instead, it should serve as a bridge—connecting children with their educators, peers, and the broader world in ways that are empowering and respectful of their individuality.

Integrating AI into the fabric of pre-primary education, especially for children with special needs, represents not only a technological advancement but a moral imperative. It reflects a society's commitment to inclusivity, equity, and innovation. As we move forward, the question is not whether AI belongs in the classroom—but how we can use it wisely, ethically, and effectively to uplift every learner.

Cultural Foundation of Inclusive Education

India's cultural ethos is deeply rooted in the principles of unity in diversity, mutual respect, and the collective well-being of all living beings. This cultural heritage has always emphasized the importance of community, cooperation, and acceptance of differences— values that align closely with the philosophy of inclusive education. From ancient times, Indian traditions have upheld the dignity of every individual, regardless of their physical or mental abilities. Concepts such as Vasudhaiva Kutumbakam (the world is one family) and Sarva Jana Hitaaya (for the welfare of all) highlight an inclusive worldview where every person is seen as an integral part of the social fabric. In many indigenous and rural

communities, children with disabilities were not isolated but participated in community life, supported by collective caregiving practices. Folktales, oral traditions, and spiritual teachings often carried messages of empathy, cooperation, and the celebration of differences. These cultural narratives fostered a sense of belonging and interdependence, creating a moral foundation for inclusive practices. For example, the Panchatantra and Jataka tales often portrayed characters of varying abilities working together to overcome challenges, symbolizing the strength of unity through diversity.

This cultural legacy provides a rich foundation upon which modern inclusive education policies and practices can be built. Rather than adopting a solely Western model of inclusion, Indian educational approaches can benefit from reclaiming these traditional values and adapting them to contemporary needs. Recognizing the cultural strengths of local communities allows for a more grounded and sustainable approach to inclusion. It encourages educators and policymakers to value local knowledge systems, community participation, and the emotional well-being of children as essential elements of learning.

Moreover, incorporating cultural values into inclusive education can help address stigma and discrimination associated with disability. When educational systems reflect the values of empathy, respect, and dignity, they foster environments where children with special needs feel accepted and valued. This cultural sensitivity not only benefits children with disabilities but also nurtures more compassionate and aware individuals in the broader society.

Educational Implications and Applications

The integration of Artificial Intelligence (AI) into special needs education has far-reaching implications and offers numerous practical applications, especially in pre-primary classrooms. These early years of education are crucial in shaping a child's cognitive, emotional, and social development. For children with special needs, personalized support and adaptive learning strategies are essential to ensure equal access to education. AI, when designed and implemented thoughtfully, has the potential to bridge gaps in learning, provide individualized assistance, and foster inclusive learning environments.

One of the most significant educational implications of AI in pre-primary education is the ability to personalize learning experiences. Every child learns at their own pace, and this is especially true for children with developmental delays or disabilities. AI-powered platforms can analyze data on a child's learning progress, behaviors, preferences, and needs. Based on this data, these systems can adjust the content, difficulty level, and pace of lessons to suit each learner. For example, an AI-enabled speech recognition app can help a child with speech delay by providing tailored exercises that adjust in real time to the child's responses, offering immediate feedback and encouragement.

AI also enhances accessibility in education. Tools like text-to-speech and speech-to-text applications, visual aids, augmented reality, and gesture-based interfaces support children who are visually impaired, hearing impaired, or non-verbal. In a pre-primary setting, where

many learning activities are visual, tactile, and auditory, AI tools can help provide multisensory learning experiences that accommodate various needs. For instance, a visually impaired child can benefit from an AI-driven audio description of picture books, while a child with limited mobility might use eye-tracking technology to interact with digital content.

Another important application of AI is its potential to support teachers in inclusive classrooms. Pre-primary educators often manage diverse classrooms with children of varying abilities, which can be challenging without additional support. AI can assist teachers by tracking individual student progress, identifying areas of concern early, and suggesting appropriate interventions. These systems can also automate certain tasks such as attendance, assessment, and progress reporting, freeing up time for teachers to focus on student engagement and emotional support.

Moreover, AI can facilitate communication between educators, parents, and specialists. By maintaining detailed digital portfolios of each child's development, AI platforms can ensure that all stakeholders are informed and aligned in their efforts. This collaboration is crucial in special needs education, where consistency and coordination significantly impact a child's growth.

Despite its potential, the use of AI in education also demands ethical consideration. The success of AI applications in pre-primary special needs education depends on thoughtful integration, sensitivity to children's privacy and emotional well-being, and the role of human educators as facilitators rather than replacers. It is vital that these technologies are inclusive by design, culturally relevant, and used to complement rather than control the learning process.

Role of AI as a Supportive Co-Educator

In the rapidly evolving landscape of education, Artificial Intelligence (AI) has begun to redefine traditional roles within the classroom, particularly in inclusive and special needs education. Rather than replacing human educators, AI is increasingly being envisioned as a supportive co-educator—a digital assistant that complements and enhances the teacher's role, especially in pre-primary classrooms where children require personalized attention and nurturing care. This collaborative role is particularly beneficial for children with special needs, who often require adaptive learning strategies, consistency, and timely intervention.

AI, when designed and implemented responsibly, can act as a co-educator by assisting teachers in monitoring and supporting individual learners. Through the use of intelligent systems that track real-time progress, learning behaviors, and emotional responses, AI can help identify areas where a child may be struggling. For instance, if a child with autism spectrum disorder (ASD) is not responding well to a certain activity, an AI system can detect changes in eye movement, facial expression, or interaction frequency, and alert the teacher.

This allows for timely modification of teaching strategies tailored to the child's specific needs.

Another key role of AI as a co-educator is its ability to offer repetitive, consistent, and non-judgmental support—an aspect that is highly valuable in special education. Children with learning disabilities or developmental delays often need more time and repeated exposure to grasp concepts. Unlike human teachers who may be constrained by time and class size, AI-based systems such as educational apps and learning bots can provide unlimited practice with immediate feedback, encouragement, and error correction without fatigue or frustration. This consistency builds confidence in learners and reduces anxiety related to performance.

AI also supports multimodal teaching, which is especially important in pre-primary classrooms. As a co-educator, AI can bring interactive and engaging content to life using visual, auditory, and kinesthetic learning modes. For example, a child with dyslexia may benefit from text-to-speech features, while a child with ADHD might stay more focused with gamified learning experiences designed by AI. These technologies adapt dynamically to a child's preferred learning style, creating an inclusive environment where all children, regardless of ability, can participate meaningfully.

Moreover, AI tools can act as communication bridges between children with communication challenges and their peers or teachers. For instance, children who are non-verbal can use AI-enabled speech-generating devices to express their needs and thoughts, fostering inclusion and peer interaction. This not only enhances the child's learning but also strengthens the classroom's social fabric by encouraging empathy, understanding, and shared learning.

Teachers, especially in inclusive settings, carry a tremendous responsibility of catering to diverse learning needs while managing administrative and instructional tasks. AI as a co-educator can help reduce this burden by automating routine tasks such as attendance, report generation, and assessment. By freeing up valuable time and cognitive energy, teachers can focus more on emotional connection, observation, and individualized instruction—components of teaching that cannot be replicated by machines.

However, for AI to truly succeed in this supportive role, collaborative integration with human educators is essential. The human element—empathy, intuition, and cultural understanding—remains irreplaceable, particularly in early childhood education. AI should not replace, but rather amplify the teacher's abilities to identify needs, nurture potential, and cultivate a compassionate learning environment. Educators must be trained to use AI tools ethically, understand their limitations, and leverage their strengths in tandem with traditional teaching methods.

Preserving Cultural Identity in AI-Driven Education

As artificial intelligence (AI) continues to shape modern education, especially in the realm of inclusive and special needs learning, it becomes increasingly important to ensure that the use of AI does not overshadow or erase cultural identities. In pre-primary education, where foundational values, language, and social behaviors are introduced, preserving cultural identity is not merely an academic concern but a moral and developmental imperative. Children learn who they are in relation to their culture, and any educational model that fails to acknowledge this risks creating a disconnection between the child and their heritage.

AI systems, when designed without cultural sensitivity, can inadvertently promote dominant global narratives

while ignoring indigenous, local, or minority cultures. For example, educational AI tools that rely solely on Western stories, customs, and languages may fail to represent the lived experiences of children from tribal, rural, or marginalized communities. In such contexts, children with special needs may feel further alienated if the tools intended to support them do not reflect their own cultural environments. Therefore, culturally adaptive AI systems are essential to foster a sense of belonging and identity in the learning process.

Preserving cultural identity in AI-driven education means designing content that is linguistically inclusive, symbolically respectful, and narratively diverse. In multilingual countries like India, where local dialects carry cultural wisdom and familial meaning, AI tools must include voice recognition, instruction, and communication support in regional languages. For example, a speech-supportive AI device used by a non-verbal child should be capable of generating communication not just in English or Hindi, but also in regional or indigenous languages like Wancho, Khasi, or Tamil. This linguistic inclusion reinforces the child's cultural roots while supporting their learning and communication needs.

Another important aspect of cultural preservation is the integration of local stories, festivals, traditions, and customs into AI-powered educational content. For children with special needs, exposure to culturally relevant narratives helps them connect emotionally and cognitively with the learning material. A child with autism, for instance, might respond better to familiar characters and settings from local folklore than to foreign or unfamiliar imagery. By embedding local traditions into visual, auditory, and interactive content, AI can serve as a bridge between tradition and technology rather than a force of erasure.

Furthermore, culturally sensitive AI tools can support intergenerational learning, where family members—especially grandparents—play a significant role in storytelling, rituals, and moral instruction. AI platforms can be designed to include family participation, allowing elders to contribute stories or traditional knowledge through multimedia recordings, thus bringing ancestral wisdom into the digital classroom. This not only strengthens family bonds but also validates the cultural practices that children see at home, fostering respect and pride in their heritage.

Preserving cultural identity in AI-driven education also has implications for teacher training and policy development. Teachers need to be aware of the cultural content embedded in AI tools and should be encouraged to co-create or customize digital lessons that reflect their students' cultural realities. Similarly, policymakers must support the development of decentralized, culturally flexible AI platforms, especially for use in rural and tribal schools, so that no child is forced to learn through content that feels foreign or irrelevant.

However, care must be taken to avoid reinforcing stereotypes or limiting children to narrow cultural roles. The goal is to preserve identity while promoting intercultural understanding and global awareness. AI should empower children to celebrate their own culture while learning to appreciate others, thereby nurturing both self-respect and empathy—a critical skill in inclusive education.

Conclusion:

The integration of Artificial Intelligence into special needs education at the pre-primary level holds remarkable promise, especially within the diverse and culturally rich context of India. As this journal has explored through

cultural, philosophical, and educational lenses, AI can serve as a powerful tool to make learning more inclusive, accessible, and personalized.

However, its effectiveness depends on how thoughtfully and ethically it is applied. AI must not be seen as a replacement for human interaction, but rather as a complement that enhances the capabilities of teachers and caregivers. The essence of early childhood education lies in nurturing emotional security, curiosity, and trust—elements that are deeply rooted in human relationships and cultural values.

At the same time, it is vital to recognize and address the challenges that accompany the use of AI in education. Issues of digital inequality, algorithmic bias, and loss of personal connection must be approached with sensitivity and care. Strong policy frameworks, guided by the inclusive vision of NEP 2020 and the technological ambition of Digital India, must ensure that AI tools are safe, equitable, and accessible to every child, regardless of background or ability.

Ultimately, the successful implementation of AI in special needs education requires a collaborative effort involving educators, parents, policymakers, technologists, and communities. When AI is developed and deployed with empathy and inclusiveness at its core, it can truly transform the learning experiences of children with special needs. By bridging tradition with innovation, we can build a future where every child—regardless of their abilities—has the opportunity to learn, grow, and thrive.

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