THE ROLE OF ARTIFICIAL INTELLIGENCE IN EDUCATION IN INDIA FOR 2047: THE 'VIKSIT BHARAT MISSION

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1. Introduction

The 'Viksit Bharat Mission' represents India's ambitious vision to emerge as a developed nation by its centenary of independence in 2047. Central to this vision is the transformation of education through technological advancements. Artificial Intelligence (AI) is poised to play a critical role in this transformation, promising to address longstanding educational challenges and enable a more personalized and inclusive learning experience. This paper examines how AI can be integrated into India's educational system to align with the goals of the 'Viksit Bharat Mission.' Education is fundamental to national development, and India's journey towards becoming a developed nation by 2047 necessitates a paradigm shift in its educational practices.

2. Historical Context of Education in India

2.1. Pre-Independence Era

The education system in pre-independence India was diverse, comprising traditional Gurukul systems and British-era schools. The emphasis was on rote learning and limited access. Use of technology was not much needed at that time as close personal relationship between 'Guru and Shishya' was in ancient time, whether it is vaidik era of education, Buddhist education system or Islamic education system. Whereas in British periods limited numbers of students were enrolled as policy of 'filtration theory' was in practice. Although modern practices were used in education as were used in European countries.

2.2. Post-Independence Developments

Post-independence India saw significant educational reforms, including the establishment of a national curriculum and expansion of access to education. However, challenges such as quality disparities and outdated methodologies persisted. For a long time curriculum, teaching methodology and system of evaluation was influenced with the British times. Technology and machine learning was limited to teaching methodology and evaluation.

2.3. Current Status of Education in India

Today, India has made strides in increasing enrollment and literacy rates. Nonetheless, issues like unequal access, varying quality of education, and the need for modernized teaching

methods remain. Challenges regarding huge investment in infrastructure and other educational resources are required bitterly. A large number of populations are still waiting for the quality education. India's overall literacy rate of 74.04% is below the world average of 86.3%. The female literacy rate is still significantly lower than the global average. Quality of education is also a major issue. NEP2020 aims to develop knowledge, skills, values and dispositions that support responsible commitment to human rights, sustainable development and global well-being.

3. AI in Education: Global and Indian Perspectives

3.1. Introduction to AI

Modern era is era of technological changes. The world is changing day by day. With the proper use of information and technology, any country can change its present scenario and can be one of the most developed countries. Education plays an impactful role in this journey towards development. Now a day's one term called AI is most trending term in every field. Full form of AI is Artificial Intelligence. Many areas get benefited with the help of AI. John McCarthy is considered as the father of AI. He was an American computer scientist and the term 'Artificial Intelligence' was given by him. Other names like Marvin Minsky, Alan Turing, Allen Newell and Herbert A. Simon are also considered as founder of Artificial Intelligence along with John McCarthy.

3.2. AI Technologies and Applications

Artificial intelligence in its broadest sense is intelligence exhibited by machines particularly computer systems. It is a field of research in computer science that enable machines to perceive their environment and use learning and intelligence to take actions that maximize their chances of achieving defined goals. Such systems are enabling with advance level of historical data and knowledge about each and every related field. AI allows machines to execute tasks that have traditionally required human cognition. AI-powered programs and devices can make decisions, solve problems, understand and mimic natural language and learn from unstructured data. AI encompasses a range of technologies including machine learning, natural language processing, and robotics. In education, AI applications include intelligent tutoring systems, adaptive learning platforms, and automated administrative tools.

3.3. Case Studies from Developed and other Countries

Countries like the USA and Finland have integrated AI to enhance personalized learning, streamline administrative tasks, and support teachers. South Korea is using AI-powered digital textbooks catering to different students' levels, the UAE with AI-powered virtual tutors use for personalized learning and West African academies using AI-enabled virtual mentors for tailored learning experiences. Automating administration in education is spotlighted as of much importance by Bernard Marr, an author, futurist and technology advisor who cites figures

forecasting 47.5% growth from 2017-2021 in the use of artificial intelligence in education in the U.S. These case studies offer valuable insights for India.

3.4. **Lessons Learned and Best Practices**

Successful AI implementations in education have emphasized the importance of robust infrastructure, data privacy, and ongoing stakeholder engagement. It helps automate routine administrative tasks like scheduling, grading and student enrollment. It saves educators and administration staff's valuable time, allowing them to focus more on value-added activities.

3.5. **Existing Applications of AI in education in India and world**

In India, institutions such as the Indian Institute of Technology (IIT) Bombay and University of Hyderabad have implemented AI-driven tools for education. These examples demonstrate the potential of AI to enhance learning experiences and provide insights into successful integration strategies. Some AI-driven systems are as follows -

Adaptive Learning Platforms: AI-driven platforms like BYJU'S and Vedantu offer personalized learning experiences.

Automated Grading Systems: AI tools are being used to grade assignments and assessments, reducing the burden on educators.

Chatbots for Student Support: AI-powered chatbots like Siri of Apple and Alexa of Amazon provide 24×7 assistance to students, answering queries and providing resources. OpenAI's release of ChatGPT - a natural language processing chatbot- in the fall of 2022 brought AI to many people's attention for the first time.

List of some AI-infused specific technologies being used in education

Thinkster Math: it is a math tutoring program take advantage from human interaction and groundbreaking AI to create personalized learning programs.

Jill Watson: an AI-enabled virtual teaching assistant introduced by Georgia Institute of Technology in 2016.

Brainly: a social media site for classroom questions.

Nuance: speech recognition software used by students as well as teachers; capable of transcribing up to 160 words per minute; especially helpful for students who struggle with writing or have accessibility needs.

Cognil: AI-based products, including a virtual learning assistant, for kindergarten to class 12 and higher education institutions, as well as corporate training organizations.

KidSense: AI educational solutions which are designed for children, including a voice-to-text tool with algorithms built to recognize the sometimes harder-to-translate speech of young learners.

Content Technologies: instructional design and content application solutions driven by artificial intelligence research engines. These are used to turn raw data into information, and information into knowledge.

Palitt: built to help instructors easily create their own custom lecture series, syllabus or textbook.

Cram101: it turns any textbook into a smart study guide complete with chapter summaries, unlimited true-false and MCQ tests and flashcards all drilled down to a specific textbook, ISBN number, author and chapter.

Just the facts101: intended to function as the AI enabled of an old-fashioned yellow marker, instantly highlighting and generating book and chapter-specific summaries.

4. The 'Viksit Bharat Mission' and Educational Goals

4.1. Mission Objectives and Educational Vision

The Viksit Bharat mission aims to transform India into one of developed nations by 2047, and education will play a key part in this vision. The mission aims to create a world-class education system that is inclusive, innovative, and aligned with global standards. AI is envisioned as a key enabler in achieving this vision.

4.2. Strategic Priorities for Education

The strategic priorities include enhancing educational quality, ensuring equitable access, and fostering innovation through technology.

4.3. Role of Technology in Achieving These Goals

Technology, particularly AI, is expected to play a pivotal role in realizing these priorities by providing tools for personalized learning and efficient management.

5. AI's Potential Impact on Indian Education

5.1. Personalized Learning

AI can tailor educational content to individual learning styles and paces, helping students grasp concepts more effectively. Specific skills, such as critical thinking, problem-solving, creativity and decision making can be also developed with the help of AI.

5.2. Adaptive Learning Systems

Adaptive systems use AI to modify learning pathways based on student performance, ensuring a more customized learning experience.

5.3. Intelligent Tutoring Systems

These systems offer real-time feedback and support, acting as supplementary tutors that can assist with a range of subjects.

5.4. Data-Driven Insights and Analytics

AI can analyze educational data to identify trends, monitor student progress, and inform policy decisions.

5.5. Enhancing Teacher Training and Support

AI can provide professional development resources and support for teachers, helping them integrate technology into their classrooms.

5.6. Bridging Educational Gaps

AI tools can offer additional resources and support to remote and underserved areas, helping to reduce educational disparities. Virtual classrooms, powered by AI, can facilitate interactive learning experiences for students who may not have access to traditional educational infrastructure.

5.7. Administrative efficiency

Administrative efficiency for educational institutions can be improved with the help of AI.

5.8. Adaptive assessments

AI can help develop adaptive assessments that provide a more holistic evaluation of student's abilities and skills.

5.9. Easy learning methodologies

AI-powered educational games and videos can make difficult subject materials more accessible and help students grasp concepts more easily and deeply.

5.10. Dynamic learning environment

More dynamic, effective and accessible environment can be developed with the help of AI.

6. Challenges and Opportunities

6.1. Infrastructure and Accessibility

The effective implementation and success of AI in education depends on robust digital infrastructure, including reliable internet connectivity and accessibility to modern devices, particularly in rural and remote areas. This will lead to equitable access to AI-driven educational tools.

6.2. Data Privacy and Security

The use of AI involves handling large amounts of student data. So raising concerns about privacy and security that must be addressed. Ensuring data privacy and security is paramount

to protect sensitive information and comply with regulations such as the General Data Protection Regulation (GDPR) and the Personal Data Protection Bill (PDPB) in India.

6.3. Equity and Inclusivity

Ensuring that AI tools are accessible to all students, regardless of socio-economic status, is crucial for equitable education.

6.4. Resistance to Change and Skill Gaps

There may be resistance to adopting AI in education, and addressing skill gaps among educators is essential for effective implementation.

6.5. Collaboration between Stakeholders

Successful integration of AI requires collaboration between government, educational institutions, technology providers, and other stakeholders.

6.6. Ethical and Bias Issues

AI systems must be designed to avoid reinforcing existing biases and ensure fairness in educational opportunities. Developers should prioritize creating unbiased algorithms and implementing measures to address any ethical concerns related to AI use in education.

7. Policy Recommendations and Strategic Framework

7.1. Developing AI-Enhanced Curricula

Curricula should incorporate AI tools and methodologies to prepare students for a technology-driven future.

7.2. Investing in AI Infrastructure

Investment in digital infrastructure is necessary to support the widespread use of AI in education.

7.3. Fostering Public-Private Partnerships

Collaborations between government bodies, educational institutions and technology companies can drive innovation and implementation of AI in education. Public and private sectors jointly can drive innovation and ensure the effective deployment of AI technologies. They facilitate the development of AI tools, providing funding and support pilot projects.

7.4. Enhancing Teacher Training Programs

For AI tools to be effectively utilized, educators must receive adequate training. Professional development programs should include teachers' training on AI tools and their application in teaching and leverage data insights for improved educational outcomes.

7.5. Ensuring Data Privacy and Ethical AI Use

Policies must be developed to safeguard data privacy and ensure ethical use of AI in education.

8. Future Directions and Conclusion

8.1. Emerging AI Technologies

Future advancements in AI will continue to shape the educational landscape, offering new opportunities for personalized learning and administrative efficiency.

8.2. Long-Term Vision for Education

The long-term vision should focus on creating a resilient and adaptive educational system that leverages AI to meet evolving needs.

8.3. Final Thoughts on AI's Role in the 'Viksit Bharat Mission' 2047

AI has emerged as a revolutionary force, cutting across traditional boundaries and changing and developing industries across the globe. The global adoption of technology in the education sector is tremendously changing the way we teach and learn. In education sector, AI is proving to be game-changer, bringing significant opportunities in teaching methodologies, personalized learning, evaluation and feedback and overall student engagement. AI holds the potential to transform education in India, aligning with the goals of the 'Viksit Bharat Mission' 2047 and contributing to a more developed and equitable society. For this AI can be utilized with more potential with the combining power of both machines and teachers.

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