

Artificial Intelligence for Inclusive Education: A Step towards Attaining SDG-4

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ABSTRACT:

Artificial Intelligence or AI refers to the ability of machines to perform tasks mainly like Thinking , Problem Solving and Decision making. Artificial Intelligence in Education refers to the integration of AI technologies - to enhance teaching, personalize the student experience, optimize administration, and support decision-making. India the country with diverse crowd of students of different socio-economic background, demographic conditions, languages, emerging AI technology and tools is going to play crucial role in achieving the Sustainable Development Goal(SDG)-4 which aims to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all. This paper will describe how AI tools like Machine Learning & Adaptive Algorithms, Natural Language Processing (NLP), Predictive Analytics, Intelligent Tutoring system (ITS) can be use to enhance Class-room teaching, Evaluation, Research, Administration, Accreditation i.e teaching learning process in all and reaching out to unreached. The paper also discuss challenges posed due overreliance on AI and strategies to ensure ethical use of AI, particularly in education.

Keywords: AI, Inclusive education, SDG-4, Machine learning, NLP, ITS.

Introduction:

AI is defined as the technology that aims to mimic the human brain, enabling machines to acquire, adjust, and make data-driven decisions based on experience. This vision was primarily articulated by Alan Turing and John McCarthy, who coined the term in 1956 (Crompton and Burke, 2023)^[6]. Artificial Intelligence (AI) can help to overcome the hurdles of language barrier, socio-economic background, it also caters to the need of all students regardless of their aptitude , disability, location. AI tools helps transforming higher education by enhancing teaching efficiency, personalizing student learning, and streamlining administrative tasks. From generative AI for course design to intelligent grading systems, these tools are reshaping how faculty teach and how students engage with content. Integrating AI in teaching aims and support Outcome Based Education.

Enhancing Student Performance:

Personalized/customized Learning: Adaptive platforms tailor content to individual student needs, improving engagement and outcomes. NLP with Machine Translation (MT) can be applied to deliver content in different languages. It can also help bridged cultural gap by curating relevant content so that it suits students cultural background. Adaptive tools like Coursera, Duolingo, Knewton helps in lesson planning, language matching, need based personalized study/course path for students.

AI-powered adaptive learning platforms move beyond a one-size-fits-all curriculum. They continuously analyse learner behaviour to adapt content difficulty, recommend relevant resources like videos or readings, and tailor practice problems to individual needs, pace and style.

Chatbot (24 x 7 help desk): Multilingual advising systems, Emotion aware chatbots, Integration with predictive analytics are the future of chatbot technology. Students can get answers for routine queries regarding admission, fees, hostel, assignment submission can be answered even after office hours which saves time and make the process faster. Advanced models such as large language models LLM will further improve conversational capabilities

Efficiency for Faculty: Effective and result oriented lesson planning using A.I tools like Magic School, Eduaid.AI, Copilot they not only save time but also help teacher identify the key concept and effective methods to deliver it. Lesson planning Automated grading, and instant feedback, saves time of both the teacher and students. Use of A.I agent to handle routine administrative work saves more time for teacher to focus on academics.

Enhanced Research Support: AI-powered search using tools like Scispace, Perplexity, Google Gemini , Elicit ,ChatGPT accelerate academic research, empowering teacher which further reflect in classroom teaching.

Skill Development: Writing assistants and language models help students improve communication and critical thinking.

Data-Driven Insights: Learning analytics identify struggling students early and suggest interventions. Early identification of at risk student allows to decide future course of action without human intervention.

Improves Teaching Practices :

Course Design: Generative AI helps faculty create syllabi, assignments, and simulations aligned with learning goals.

Curriculum Optimization: AI analyses student performance, feedback, and market trends to identify skill gaps and ensure educational content is relevant and effective.

Student Support: Chatbots provide 24/7 assistance for FAQs, deadlines, and academic guidance. Smart campus.

Interactive Learning: AI-driven simulations and virtual labs make abstract concepts more tangible. Intelligent tutoring system/Robots, NLP, Augmented and Virtual reality, speech to text and vice versa, gamifying course content, performance based analysis and instant feedback make learning stress free.

Accessibility: Tools like speech-to-text and translation services support diverse learners.

Assessment: Automated grading systems reduce bias and speed up evaluation. Automated grading system help student write answers as per the guidelines or directions cited (rubric model), performance analysis, instant feedback is possible. Making student understand his/her mistake. Rubric is a scoring guide that tells student what is expected and how the marks are awarded.

AI Tools For Teaching.:

Below are some of the examples of AI Tools that can be employed in Teaching learning process.(ref. table 1 and table 2)

BASIC	Application	PRO
PERPLEXITY	Research	CHATGPT
IDEOLAB	Images	MIDJOURNEY

PICAGRAM	Video	RUNWAY
ANYWORD	Writing	WISPR
GOOGLE DOCS AI	Notes	NOTION AI
DECKTOPUS	Presentation	GAMMA
BARDEEN	Automation	ZAPIER
CLAUDE	Coding	CURSOR
HEYGEN	Avatar video	SYNTHESIA
CANVA	Design	ADOBE FIREFLY

Table1 summarizes basic and pro AI tools

A.I Tools	Purpose
Grammarly	Writing assistant
Perplexity	Research purpose
Notebook LM	Presentation if the user is sure of source material.
GoogleGemini, Grok, ChatGPT	Information, knowledge seeking
Nano banana/Paper banana, Canva	Commercial/ general image generation
Claude	Coding
Scispace	For searching research papers, literature survey, dissertation outline
Genspar, Gamma	Presentation

Table 2 commonly use AI tools with their application

Key AI Components

Machine Learning & Adaptive Algorithms: Systems learn from data to adjust pacing, challenge levels, and resource recommendations as students progress.

Natural Language Processing (NLP): Enables chatbots, automated feedback, translation, and interactive learning aids these are extremely helpful and supports special need and remote learners.

Data Analytics & Predictive Modelling: Analysis of student metrics to forecast needs, optimize curriculum, and signal early intervention opportunities

Intelligent Tutoring Systems (ITS): Simulate one-on-one tutoring experiences with immediate, tailored instruction and feedback.

Augmented/Virtual Reality (AR/VR): Creates immersive, AI-enhanced learning simulations for subjects that benefit from visualization and Interactivity. Many of the abstract concept in maths science say quantum mechanics, non linear mechanics, statistical mechanics which are otherwise hard to visualize can be made simpler and easy using AR/VR.

AI in Administration/ Accreditation

Operational Efficiency: AI automates routine tasks such as admissions processing, financial aid management, and records management, allowing staff to focus on strategic initiatives.

Student Support and Accessibility: AI-powered chatbots and virtual assistants provide 24/7 academic and administrative guidance, improving student engagement. For example Georgia University AI chatbots

provide immediate, personalised support to prospective and current students, answering critical questions on admissions, fees, housing, assistantship, Placement, alumina meet etc., this reduces burden on staff and ensures no query goes unanswered.

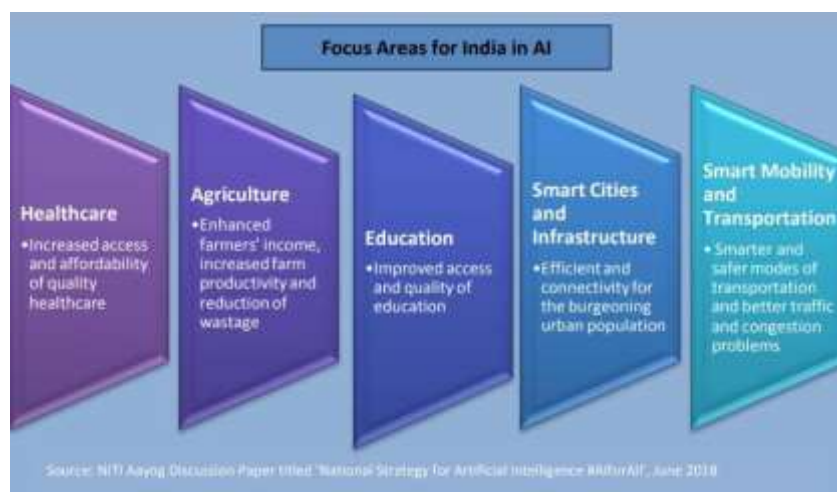
Automated Reporting: AI simplifies the accreditation process by automating data collection, evidence collection, and report generation, minimizing the last-minute scramble.

Compliance Tracking: AI frameworks ensure institutions continuously meet standards for accreditation (e.g., student outcomes) by tracking, mapping, and analysing data dynamically.

Ethical Oversight: Modern QA includes auditing AI systems for bias, ensuring transparency, and maintaining human-in-the-loop for key accreditation decisions.

Indian Scenario: AI's integration into higher education has evolved from theoretical foundations to practical tools enhancing teaching, learning, and administration. According to the report the Indian AI market is expected to grow at a rate of 25%-35% through 2027. To support this growth, India, which had an AI talent pool of 600,000-650,000 in 2024, needs over 1.25 million AI professionals by 2027, at a 15% CAGR, according to NASSCOM

AI is identified as mean to transform education, economy and a country as a whole. Govt. of India mandated **NITI Aayog** to establish the National Program on AI. #AIFORALL



India's comprehensive AI education strategy - aligned with NEP 2020 and the India AI Mission - spans curriculum integration from primary to higher education, teacher capacity building, infrastructure development, skilling initiatives, and research Centres of Excellence. The Right to Education Act 2009 and the National Education Policy 2020 (NEP) have played a crucial role in shaping the education landscape by expanding access to quality education universally, promoting equity, and driving innovation in teaching and learning. 23 IITs, 21 IIMs & 20 AIIMS in India, alongside establishment of 2 international IT campuses in Zanzibar and Abu Dhabi Academic Bank of Credit covers 2,660 institutions with over 4.6 crore IDs issued Indian HEIs to offer twinning, joint & dual degree programmes with reputed foreign universities.

Govt. of India's initiative Massive Open Online Courses (MOOC's) in some cases are applying NLP and MT in combination with Crowdsourcing. Then Swayam, Diksha and with AI powered educational tool Eklavya that communicate, evaluate and mentor the masses without human intervention. The approach

extends beyond urban centres to tribal and aspirational districts, democratising technology access across all communities.

Challenges:

There are some potential drawbacks of excess and unmonitored use of this AI technology, First and foremost is ethical concern, data privacy and academic integrity. Fair chances are there that either intentionally or unintentionally sources are not cited properly, copyright data use without consent and so on. Apart from these the other slightly ignored issues are mentioned as follows:

1. Students stop thinking, reasoning, lacks patience(habit of getting answer at single click), small attention span, less focus, reading/ writing habits disturbed as these students hardly take pen and note book to write.
2. Health issues arising because of too much screen time.
3. Electricity ,internet failure common in India can disturbed, delayed the submission, increase anxiety.
4. Talking or chatting with machine rather than with friends makes them less social.

Strategies to maximize benefits, reducing risk factor.

UNESCO produced the first-ever global standard on AI ethics – the ‘Recommendation on the Ethics of Artificial Intelligence’ in November 2021. It is applicable to all 194 member states of UNESCO. The protection of human rights and dignity is the cornerstone of recommendation. Ethical concerns, equitable access and digital literacy are directly comes under the four core value (respect for human right, dignity, ensuring inclusiveness, safe environment). To ensure inclusive and equitable quality education in AI an institution, Universities should set practical guidelines to create balance, agile flexible pre-innovation future ready network. Train teaching as well as non teaching staff. the various strategies at the institute level that can be deployed to mitigate risk factor and use the AI technology in more sensible and responsible way are discuss below(ref. Table 3)

Pilot project	Start small instead of full fledge deployment. First try it out at smaller scale : Use AI for grading or writing support before scaling to full course design
Blend AI with Human Oversight	Ensure faculty remain central to teaching, using AI as a support tool
Promote AI Literacy	Teach students how to use AI responsibly in research and assignments.
Monitor Outcomes	Use analytics to track whether AI tools improve student performance.
Stay Updated	Regularly explore new AI platforms to avoid falling behind in pedagogy.
Bias in Algorithms	AI systems can perpetuate inequities if not carefully monitored. Say shortlisting male candidate profiles only for a particular job. That is system gives one sided unfair results because because of the data or design
Faculty Training	Effective use requires digital literacy and ongoing professional development.
Governance and Security	Universities must establish clear guidelines for ethical AI use in teaching.
Outreach Program	Industry academia collaboration , NGOs or volunteer to reach out and conduct technical session

Table 3. list of strategies to maximize benefits and reduce risk factors.

Government of India Initiative : GOI already had other policies/laws to guard the rights in data privacy like IT Act 2000, CPA 2019, BNS 2023, NIST AI risk management framework 2023. The more recent is India AI governance guidelines under the India-AI Mission (Meity November 2025) enabling safe and trusted AI innovation.

Conclusion:

Artificial intelligence is not a one single technology it is combination of Machine Learning(ML), Deep Learning(DL), NLP and Generative AI. In a country like India common challenges faced by teachers in the classroom are limited teaching hours, high student teacher ratio, mixed crowd(socio-economic conditions, academically slow or fast learners), etc. in short every student path to learning is different and has different pace. To overcome these constraint integration of A I in academics is a perfect way. It has undeniable benefits such as adaptive learning tools for customize learning, ITS, Predictive analytics for tracking learners performance, chatbots etc. Learning Platforms like Swayam, Diksha, Eklavya have already open doors to learn various courses online with proper assessment and evaluation system. Regular students, drop-outs, or simply those who wish to gain knowledge can be benefitted. With continued advances in AI and NLP they happen to be permanent part of digital education ecosystem. For successful integration of AI in higher education require partnership between educators, researchers and policy makers. careful attention to system design, data privacy and ethical consideration. These issues demand comprehensive training programme for faculties, addressing at the government level through law enforcement, establishing robust governance framework for ethical use. Finally while using these tools teacher should also take care that the student should not loose their critical thinking, imagination, quantitative as well as writing skills.

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