

EDUCATION IN THE AGE OF ARTIFICIAL INTELLIGENCE (AI): BRIDGING OF EXPANDING SOCIAL INEQUALITY

*Srinivasa T.**

DOI: <https://doi.org/10.5281/zenodo.21224197>

ABSTRACT

Artificial Intelligence-enabled solutions can help identify the key areas of improvement in the education space, while analyzing the needs of each student in a personalized manner, to help every student derive the benefits of education, which can help bridge the socioeconomic inequities in the country. Artificial Intelligence (AI) and Machine Learning (ML) models are rapidly impacting all sectors that touch human lives in a myriad of ways. The education system, being integral to one's self-development, is witnessing a huge opportunity. Education becomes a tool of equality when it ensures equal access, equal quality, and equal outcomes across socio-economic, gender, and regional lines. This lies in improving the efficiency of teachers inside classrooms, by automating their activities of grading assignments, resolving students' queries, and conducting assessments.

The knowledge background and desired outcome from education play a major role in determining the learning effectiveness. Since each of these factors is specifically unique for each student, an ideal learning system cannot have a one-size-fits-all approach and must adapt to the students. Artificial Intelligence algorithms can record and track the academic and non-academic progress of students in a school and identify those who need additional attention in specific areas. The Artificial Intelligence-based digital solutions can autonomously formulate revision curriculums and learning frameworks, personalized for such students. Such applications can also assist the teachers with a customized data-driven lesson plan that can help the teacher connect with the student on a personal note and provide pedagogical interventions in the correct area. Challenges do exist in the implementation of the Artificial Intelligence solutions. The stakeholders and policymakers have to understand that Artificial Intelligence is not a substitute, but a supplement to the classroom teaching programmes.

KEYWORDS: *Bridging Socio-Economic Inequities, Grading Assignments, Knowledge Background And Desired Outcome, Artificial Intelligence-Based Digital Solutions, Curriculums And Learning Frameworks.*

Introduction

With a one-size-fits-all approach implemented for learning across the nation and with superficial insights into individual student's cognitive capabilities, the education methodology in India faces serious limitations as students don't receive personalized attention which leads to many students staying bereft of the value of education programs in the country. A huge opportunity lies in improving the efficiency of teachers inside classrooms, by automating their activities of grading assignments, resolving students' queries, and conducting assessments. While moderated pilot studies have demonstrated improvements in student learning from technology-rich, personalized blended learning, the improvements have not been realized on a large scale yet. The latest

Program for International Student Assessment scores show that, worldwide, students who use Artificial Intelligence-enabled digital devices in the classroom are performing worse than those who do not.

Artificial Intelligence algorithms can record and track the academic and non-academic progress of students in a school and identify those who need additional attention in specific areas. Artificial Intelligence-based digital solutions can autonomously formulate revision curriculums and learning frameworks, personalized for such students. Such applications can also assist the teachers with a customized data-driven lesson plan that can help the teacher connect with the student on a personal note and provide pedagogical interventions in the correct areas.

* **Dr. Srinivasa T.**, Associate Professor, Department of Sociology, Government Arts College, Bangalore.

Artificial Intelligence for Bridging Socio-Economic Inequities

AI in education can automate routine tasks, provide data-driven insights, and deliver valuable tools to improve learning. Artificial Intelligence supports student skills development for future work, from problem-solving and social-emotional competencies to technology proficiency. The standardized assessments do not evaluate a student's creativity, critical thinking, and collaboration ability. Moreover, students with special needs, dyslexia or exam fright may not be able to perform well, despite having knowledge of academic concepts and possessing distinctive capabilities. Their grades will not reflect their true potential or knowledge.

Particularly, Artificial Intelligence and intelligent automation are ushering waves of transformation in the design, delivery, and continuous improvement of learning methods. Artificial Intelligence has begun making inroads into the Indian education landscape and is enabling various use cases for adaptive learning, information visualization, digital lesson dissemination, and bridging the socio-economic and gender divide in the education space. Reducing the discrimination against socially backward classes and castes has pointed towards the need for systems that benefit people based on condition, rather than caste. It has been found essential to prevent the wealthy creamy layer from undeservingly benefitting from reservations in the education sector, while the genuinely needy population is prevented from such incentives due to other socio-economic challenges.

Education in the Age of Artificial Intelligence: Grading Assignments

Artificial Intelligence-based support automation tools can automate the function of grading assignments and examination papers. Bridging the growing gap in social inequality requires a multifaceted, integrated approach that moves beyond simple income redistribution to address structural, digital, and opportunity gaps while also conducting performance analytics for students, thereby identifying their key areas of strength and weakness. An Automated Grading System (AGS) scans human-graded assignments and examinations as a training dataset, to identify the key parameters of evaluation. Human-graded documents (including essays, research papers, classroom assignments, and quizzes) will have to be provided as a training dataset, following which these documents will be stored in a central database. Once the grading model is robust enough to provide automated assessments much closer to

human-graded assessments, it can compare the future documents with centrally stored documents and provide its assessment.

Developing nations with wide inequalities between various sections of the society face a challenge with ensuring literacy among children in marginalized sections of the society. The factors can range from poor quality of classroom instruction, poor school infrastructure, and gaps in the medium of instruction, to lack of teachers' instruction skills and low motivation factors. Artificial Intelligence-based systems can analyze complex, insights-rich datasets that include information on enrollment, gender, student performance, socio-economic demographics, and school infrastructure. Data analytics driven by machine learning models can help to identify the predictive patterns behind why students drop out, and also pinpoint the students showing a tendency of dropping out the following year.

Artificial Intelligence Inclusion in Education System

A meticulous framework for Artificial Intelligence adoption in the education sector is required to enable a phase-wise implementation process. The challenges in Artificial Intelligence adoption discussed in the preceding section necessitate a structured, milestone-based approach to help India realize the vision of an Artificial Intelligence-enabled personalized education system. The "5-I Framework" recommended henceforth covers the end-to-end journey for humanizing the Smart Education Program before institutionalizing it in the country. Therefore, the Artificial Intelligence implementation must happen in a phase-wise fashion which has to start from select pilot cities, and then expand further to other regions based on the feedback of the pilot phase and readiness of regions and schools for Artificial Intelligence use cases. Initiation of Artificial Intelligence implementation will require identification of the Artificial Intelligence applications that have to be deployed for assessing the effectiveness and impact of the technology in the education sector.

Future advancements in Artificial Intelligence, such as more sophisticated adaptive learning algorithms and real-time feedback systems, could further personalize education, making it more accessible and effective for diverse learners. Artificial Intelligence enables the creation of adaptive learning systems that tailor content to the individual needs, pace, and skill levels of students. However, for these technologies to reach their full potential, significant investments

must be made in digital infrastructure, internet access, and teacher training, particularly in low-income regions. Artificial Intelligence-driven platforms can provide personalized training recommendations for teachers and more, helping them stay up-to-date with the latest educational methods and technologies. Artificial Intelligence tools assist teachers in managing classrooms by providing real-time data on student behavior. Additionally, as Artificial Intelligence and social media become increasingly integrated into the educational landscape, there is a need for ongoing research and policy development to address emerging ethical challenges, and despite the progress, educational inequality remains a major issue, especially among poor communities. Poverty, inadequate infrastructure, and inadequate educational resources have been known to restrict access to quality education.

Artificial Intelligence Capabilities in Their Pedagogical Techniques

Training and upskilling of teachers for integrating Artificial Intelligence applications in their teaching methodologies and pedagogical tools will be crucial to onboard the instructors in the Artificial Intelligence-enabled education programs. Unless the teachers are trained on how to leverage the Artificial Intelligence capabilities in their pedagogical techniques, the inclusion of Artificial Intelligence in education will always fall short of achieving its intended outcomes. Inclusion of Artificial Intelligence in education will have to be justified with a meticulous value case derivation which shows the prospective quantitative and qualitative benefits to teachers, parents, students, schools, policymakers, thought leaders, and the Ministry of Education, among other stakeholders. The number of students reachable by the Artificial Intelligence applications, the number of schools impacted, the magnitude of the gender divide bridged, the magnitude of socio-economic divides bridged, and the increase of student satisfaction with new personalized curricula will have to be quantified, in order to justify investments in this sector. Given the knowledge barrier with regards to technology among the teachers in rural regions, upskilling them on how to use the Artificial Intelligence applications and how to measure the impact will take considerable time.

Artificial Intelligence algorithms often rely on vast amounts of data to train and improve their performance, raising questions about consent, data ownership, and user control over their personal information. Inadequate data privacy protections may result in unauthorized access, misuse, or

exploitation of sensitive data, leading to privacy breaches and violations of individuals' privacy rights. Moreover, the proliferation of Artificial Intelligence-driven surveillance technologies poses additional privacy risks, infringing upon individuals' rights to privacy and autonomy. Emotional intelligence for addressing data privacy issues requires implementing robust data protection measures, such as data anonymization, encryption, access controls, and privacy-enhancing technologies, to ensure the confidentiality and integrity of personal data analysis.

Promoting the Ethical Development for Artificial Intelligence

Governments and tech companies must collaborate to establish transparent policies that safeguard user data while promoting the ethical development of Artificial Intelligence-driven learning solutions. Promoting ethical Artificial Intelligence development requires embedding fairness, transparency, accountability, and safety into the entire lifecycle of Artificial Intelligence systems to ensure they benefit humanity. In creating a secure and inclusive digital learning environment, Artificial Intelligence and social media can serve as powerful tools in providing equitable educational opportunities for all. The integration of Artificial Intelligence and social media in education is continuously evolving, offering promising solutions to address the challenges faced by underprivileged communities.

They revolutionize education through personalized learning experiences that change in response to the individual strengths and limitations of students. Artificial Intelligence platforms, as interactive chatbots, allow students to ask questions at any time and get immediate answers to the questions they have. It can also provide students with reliable, interactive, and personalized educational material that will help them to expand their knowledge and learn effectively using data analytics and machine learning processes to monitor student progress and offer personalized feedback that enables students to better understand complex ideas. The emerging technologies such as virtual reality (VR), augmented reality (AR), and blockchain-based certification systems are expected to further revolutionize the education sector.

Conclusion

Serious challenges exist in the Indian landscape, ranging from a one-size-fits-all approach and poor infrastructure for remote education to a high rate of dropout in schools and non-personalized academic assessment for

students. Socio-economic inequities exist, and a disproportion in telecommunication infrastructure pervades across the nation. AI systems have the capability to yield adaptive learning experiences that match student individual needs. Such systems are especially valuable in regions facing teacher shortages since they provide scalable solutions that can help alleviate the gap between students and qualified teachers. But although Artificial Intelligence is seen to promise a lot of academic improvement, the challenges associated with algorithmic bias mean it is important for public sector organizations and private sector entities to collaborate and incorporate the benefits of Artificial Intelligence in education in a phase-wise manner. The inclusion of Artificial Intelligence holds the promise of digitizing, automating, and adding intelligence to several academic functions currently handled by teachers, based on their subjective assessment of their students.

References:

1. The Higher Education Review, <https://www.thehighereducationreview.com/news/why-one-size-fits-all-education-might-not-work-anymore-nid-1326.html>
2. Kishore R., Jha A., Hindustan Times, <https://www.hindustantimes.com/india-news/mapping-education-inequalities/story-xhTIIYty7kF7MNqxnOyGtO.html>
3. "Challenges of Reservation: Problems and Solutions", Career Ride, March 2015, <https://www.careerride.com/view/challenges-of-reservation-problems-and-solutions-25179.aspx>
4. Sharma Y, "How AR/VR is redefining the teaching-learning process", Education World, <https://www.educationworld.in/how-ar-vr-is-redefining-the-teaching-learning-process/>
5. ETtech, "India to have 900 million active internet users by 2025", Economic Times, June 2021.
6. Basabe, G. B., & Galigao, R. P. (2024). Enhancing career opportunities through equal access to quality education.
7. Haythornthwaite, C. (2005). Social networks and Internet connectivity effects. *Information, Community & Society*, 8(2), 125-147.
8. Geetha, V. (2025). The Role of AI in Enhancing Teaching Pedagogy and Multidisciplinary Research in Arts, Science & Commerce (Volume-17), 24.
9. Goswami, A., & Sharma, A. (2024). AI for bridging socio-economic inequities in Indian education space. *International Journal of Research and Scientific Innovation*, XI (IV), 890-935.