Transforming and Reforming the Indian Education System with Artificial Intelligence

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ABSTRACT

India's growing economy and population proves its significant stake in the Artificial Intelligence (AI) revolution. India's education and technology sector has grown exponentially over the last few years, particularly in times of Covid-19 pandemic but owing to various reasons, it is accessible to only one in four students in India. AI has proven to be of benefit to all stakeholders alike by (a) enhancing teachers' efficiency and effectiveness in managing Multi Levelled or Multi Graded Learning Units and enabling automated development of customised teaching content; (b) using Intelligent Tutoring Systems to tailor the learning materials to a child's level of competence, style and pace of learning for improving student interactivity and attention rates; and (c) for effective teacher posting and transfer systems and predicting likely student activities such as dropout rates in government schools. The research provides a comprehensive review of the rigorous inclusion of AI in India's education sector through various policy measures. According to the findings, AI increases the efficiency of grading and encourages critical thinking and analytical skills among students. Further studies can assess effective integration of AI with educational practices and policies to increase learning needs.

KEYWORDS: Critical thinking, Indian Education System, Systematic review, Artificial Intelligence in Education(AIED), EdTech, Personalised Learning

1   INTRODUCTION

The use of artificial intelligence in education in India has witnessed exponential growth post-COVID-19 (Charania et al., 2023). From 2017 to 2018, the country saw an enrolment rate of 250 million students in 1.5 million institutions (World Bank Group, 2022). Factors such as favourable demographics, unprecedented rise in Internet penetration, rising income levels and widespread use of smartphones have bolstered the metamorphic change in education systems (Suneja & Bagai, 2021). Additionally, the latent demand for e-learning models has been rising to provide adequate institutional and infrastructural support during a period where in-person classes were not being conducted (Suneja & Bagai, 2021; Bansal, 2023). Technological advancements in education through EdTech (Education Technology) and ICT-driven learning (Information and Communication Technology) will result in the overall development of human capital and an increase in productivity (Bargavi & Shanmugam, 2023). Initiatives from private and public sectors have been crucial for integrating EdTech into the mainstream Indian educational system.

The debate on education technology has been in motion since the 1990s in academia and policymakers for providing affordable learning on a large scale. The news of India's EdTech start-ups raising billions has dominated headlines over the past few years due to its surge in the Indian education sector. There has been a mushroom growth of more than 4500 EdTech companies in India currently, of which more than 400 were established after 2019 (Duggal, 2021; Fazzin, 2022; Bhargavi & Shanmugam, 2023; Dhouchak & Kumar, 2023). In 2020 alone, $2.2 billion was invested in EdTech following the countywide lockdown that paralysed the education sector. An additional investment of $1.9 billion in 2021 led to the addition of three more Indian names to the list of global EdTech unicorns (the companies valued at more than $1 billion). These include Unacademy, PhysicsWallah, Vedantu, Eruditus, and UpGrad (Ray, 2020).

India's artificial intelligence for all strategy was launched in 2018 for five key areas including smart cities and infrastructures, smart mobility and transportation, agriculture, health, and education (NITI Aayog, 2018). From the academic year 2019-20, Central Board of Secondary Education (CBSE) introduced Artificial Intelligence Integration for School Curriculum (AISC) that included importance and pedagogical support of AI in school education (CBSE, 2019). The use of AI in education primarily focuses on making learning highly interactive, highly accessible and highly individualized in nature (Karan & Angadi, 2023). These personalised, adaptive and student centred modes of learning range from smart classrooms to digitized learning content and pre-recorded teacher videos (Miglani & Burch, 2018).

AI technologies in K-12 education aim to create flexible, personalized learning systems and to automate regular teaching tasks such as evaluation and feedback (Karan & Angadi 2023). Several developments in this regard have brought various AI technologies for education into fruition. The primary softwares include Squirrel AI in China adjusts itself automatically to provide adaptive learning environment (Beard, 2020; Seo et al, 2021), the AI assistant 'Jill Watson' (Miao et al., 2021) virtually answers students queries without a human assistant, chatbots (Clark, 2020), Automated Grading Systems (AGS) (Karan & Angadi, 2023), and Intelligent Tutoring Systems (ITS) that teaches theory through examples and asks questions from specific knowledge domain (Ahmed et al., 2021). These softwares include virtual facilitators,

online learning environments, learning management systems and learning analytics.

Incorporation of these systems have been witnessed in several countries including China, Singapore, South Korea, India, European Union, Hong Kong, Japan and Spain (Karan & Angadi, 2023). Twenty-first century pedagogies are being adopted into the curriculum. International Standards of Technology Education (ISTE) have also been established to engage and collaborate teachers and learners for effective learner-driven activities (Charania et al., 2023). Additionally, the Developmentally Appropriate Technology in Early Childhood (DATEC) model has also called for meaningful integration of technology in education for play and collaboration among children (Charania et al., 2023). While ISTE is pedagogy and teaching focused for better learning outcomes, the DATEC model puts children in a central role for learning routine.

Leading edge-technologies, devices and applications, pedagogy models, and Teacher Professional Development (TPD) have been experimented with for integrating best practices in AI in Education (AIEd). AIEd is composed of the implications and vested interests of three primary stakeholders of including AI technologies in education, namely- teachers, students and the government. It includes AI for assisting educational administration by means of effectively managing Multi Levelled or Multi Graded Learning Units, for assisting and supporting learning through ITS, for accelerating achievement by tailoring learning materials according to child's level of competence, and for facilitating other core educational goals (Tuomi, 2018; Jain et al., 2020; Dhouchak & Kumar, 2023). AIEd, therefore, paves way for a Competency-based Education (CBE) as an approach to teaching, learning and assessment. Technology-enabled Learning (TEL) methodologies also provide rapidness, higher efficiency and effectiveness.

A digital gap was experienced during education provision during COVID-19 filled by Ed-Tech companies to provide virtual education (Jain et al., 2021). This surge in demand has broadened the scope of educational technology products, extending from supplementary learning platforms, exam preparation, and skills training applications to business-to-business tools that facilitate the transition of traditional educational systems to online platforms. After several COVID-19 phases, the state moved towards the physical opening of educational institutions leading to offline education. The demand dynamics of the technology-enabled learning-operated courses consequently shifted from a growth phase to a stable one. Key growth drivers of EdTech in India include the increasing young population, growing internet penetration, increasing smartphone user base, the government's digital initiative, increasing employability quotient, a lack of quality education, and low-cost online education (Dhouchak & Kumar, 2023). These technological advancements have led to higher economic growth, and an overall development of human capital and an increase in productivity (Bargavi & Shanmugam, 2023).

Indian parents are culturally inclined towards their children's educational competence. With a population of over 430 million people aged 6-23 years, the Indian education system is among the largest globally (Bansal, 2022). While the formal education system in India is diverse and regulated, the demand for informal education, which encompasses supplementary learning resources, coaching classes, test preparation, vocational training, and more, has notably risen in the last five years due to the integration of educational technology in India. This shift is particularly evident in tier 3 and 4 cities, towns, and villages, where students are now able to access quality education from remote areas through EdTech platforms (Jain et al.,2021). Increased internet accessibility and lower-priced smartphones have improved the accessibility to education through various e-learning platforms.

Several problems have also been associated with the EdTech platforms. E-learning has been claimed to lead to a digital divide (Suneja & Bagai, 2021) as issues continue to pertain to Internet accessibility, access to digital devices, power supply and technical expertise. Additionally, surveys indicate that 84% of teachers need more technical know-how, Internet signal and data expense (Suneja & Bagai, 2021). Various language challenges, a lack of regulatory frameworks and quality concerns have also plagued the integration of EdTech towards imparting education (Bhargavi & Shanmugam, 2023; Dhouchak & Kumar, 2023). It is also important to note that despite these challenges, EdTech has proved beneficial in bridging supply gaps and has democratised education to make it more accessible.

The results of fusing cutting-edge teaching methods with technology have entirely transformed educational systems worldwide (Pinto & Leite, 2020; Bansal 2023; Dogan et. al., 2023; Sharma et al., 2023). AI is being implemented and used by academic institutions across the globe for grading, assessments, learning, administration, and tutoring. The inclusion of AIEd has been used to solve various challenges in the current education system. Steps towards inclusion of AI in Education include curriculum changes, changes in education policy, development of manuals, projects for improving AI competencies and knowledge among K-12 students, inclusion of machine assistants in classrooms, games-based learning systems, search trees and decision trees, and new teaching-learning approaches (Su et al., 2022).

It has been noted that the quick development of educational technology is redefining the way that education is delivered in the modern world. Therefore, it becomes essential to comprehend the traits, opportunities for the future, prospective obstacles, and present difficulties, as well as their effects on the education and skill development of numerous university students. Emerging literature on the subject has been focusing on the perceived efficacy and its contribution to the improvement of student learning outcomes (Miglani & Burch, 2018; Tilak, 2021; Bhargavi & Shanmugam, 2023; Karan & Angadi, 2023; Mishra, 2023; Sharma et al., 2023), public- and private- funded Ed-Tech platforms (Tilak, 2021; Dhouchak & Kumar, 2023; Mishra 2023; Sayed et al., 2023), use of technology for teachers' professional development (Jain et al., 2021; Charania et al., 2023), and potential risks of AI integration into school education system (Tilak, 2021; Karan & Angadi, 2023).

There still exists a knowledge gap regarding the policy documents that chart AIEd integration in India. By utilizing an ecosystem of information and communication technologies, education technology is utilized to improve training and teaching. Educational technologies make learning more affordable, accessible, and enjoyable by utilizing online resources, tablets, cellphones, and the internet. By providing individualized learning opportunities, they are revolutionizing the educational landscape and raising student achievement. The present research examines the role of AI in India's education sector.

During this research, we conducted a detailed examination of various advancements in analysis implemented worldwide, such as computer science approaches applied to the education sector, to summarise and highlight the significance of AI in teaching and

student analysis. Our findings reveal that AI is the foundation of all information science-enabled intelligent tutoring systems. These systems aid in developing skills such as self-reflection, responding to deep questions, conflict statement partitioning, artistic query generation, and decision-making abilities. This research aims to elucidate the meaning, concepts, prospective applications, effectiveness, and challenges of artificial intelligence (AI) concerning the Indian education system, considering its potential applications and efficacy. A systematic review of various policy initiatives has been conducted to be thematically analysed to understand India's technology readiness.

2   NEED FOR AI IN EDUCATION

In India, schools are usually graded according to the age of students. However, the classroom is not homogenous, and learning levels can differ widely from one student to another. Teachers need adequate information about the differences in learning between students and various contexts within their classes (Charania et al., 2023). By doing so, it is possible to build algorithms that can deal with the different learning needs of learners by using big data.

The foundation of AI in its current incarnation is the abundance of data that computers and people can examine to create a code that finds correlations and patterns that suggest actions to advance learning. However, such big data in education would include student reactions to these activities, which can be assessed, as well as information on learning transactions, including the iterative use of teaching-learning materials (curricular content) organised via learning activities (pedagogy).

3   MATERIALS AND METHOD

3.1   Search Strategy and Terms

To achieve the objectives of the present study, relevant information has been collected from various sources. The information regarding central government policies and notifications on the inclusion of AI in the Indian education system was identified and collected. The primary reports of the government were collected from official central government websites on 'Artificial Intelligence in Education (AIEd),' 'AI integration,' 'AI literacy,' 'AI adoption,' 'education technology (EdTech),' 'AI at Higher Education Institutions (HIE),' 'AI inclusion at school level.' The search terms were selected based on the reports of previous studies as well as researchers' assumptions. The assumptions were based on the relevance to key areas under study. The reports have been identified and collected electronically from open government databases and repositories.

3.2   Inclusion and Exclusion Criteria

Based on the research purpose and question, inclusion and exclusion criteria were designed. The criteria were used to filter the initial selected articles which focused on AI in education (Table 1). The screening process filtered out the reports that (a) did not match the key themes, (b) were not central government or a central government body's policy document, and (c), after preliminary reading, did not match the primary aims of the study. After the screening process, four policy reports were selected for analysis (Table 2).

Inclusion	Exclusion
Policies and notifications by central government and central bodies	State government policies and notifications
Policies that reflect inclusion of AI in Education	Policies that do NOT reflect on AI in Education in particular, K-12 or higher education
Published between 2018 and 2023	Published out of time frame
Documents that reflect on aspects of Artificial Intelligence in Education (AIEd), AI integration, AI literacy, AI adoption, Education Technology (EdTech), AI at Higher Education Institutions (HIE), AI inclusion at school level	Cybersecurity and safety reports, reports on legal and ethical issues, policy documents that elucidate the inclusion of sectors other than education, and curriculum changes that do not concern AI inclusion.

Table 1: Inclusion and Exclusion Criteria

Author	Year	Policy report
NITI Aayog	2018	National Strategy for Artificial Intelligence
Ministry of Human Resource Development	2020	National Education Policy- 2020
Ministry of Skill Development and Entrepreneurship	2023	National Programme on Artificial Intelligence (NPAI) Skilling Framework
National Educational Technology Forum	2023	Design and Architecture Framework for Education Ecosystem Registry

Table 2: The details of selected reports

3.3   Methodology

The present study is an exploratory research where a systematic review of central government and bodies' policy reports and notifications has been conducted. A thematic analysis of the policy reports was conducted to interpret and analyse the documents for a systematic review. Karan and Angadi (2023) identified nine primary themes adapted from Braun and Clarke's thematic framework. In 2006, they were used as indicators for selecting the documents and defining the inclusion and exclusion criteria for the evaluation (Table 3). Karan and Angadi have used the framework to outline the impact of NEP-2020 on the development of school curricula towards AI integration.

Nine themes emerged from three primary concepts, namely, meaning or broad perception, definition and usability or impact of AI. These concepts are in line with the research objectives as they're the primary categories while assessing policy documents. AI incorporation, literacy, readiness, pedagogical approach, subject teaching, innovation, privacy, divide and trustworthiness are the primary factors that play a role in gauging the readiness towards adapting the policies.

The model was adapted to include digital skills, intelligent online tutoring learning systems, new trends towards globalised social learning, personalised education possibilities, equality and transparency in educational opportunities, and distance learning as sub-themes. These subthemes were selected on the basis of previous studies and research objectives of the present study.

Table 3: Indicators for analysis of sample documents (Karan & Angadi, 2023)

Concepts	Themes	Sub-themes	Strategies

Meaning of AI: How AI is perceived in education	AI incorporation	·Accepting technological changes. ·Integrating in teaching and learning. ·Deploying in school and HEI administration. ·Distance education. ·Personalised education possibility.	Planning, co-ordination, managing, etc.
	AI literacy	· Ethical use of AI. ·Basic knowledge of AI. · Understanding the importance of AIEd.	Strategies to build AI literacy
Defining AI: How AI is defined to use in school education	AI readiness	· Skills of using AI. · Computational skills. · Digital skills. ·Digital learning abilities. ·E-learning abilities.	Type of training, orientations, capacity building proposed to provide.
	Pedagogical approach of AI	·Applying AI applications, tools, AI-based devices. ·Intelligent tutoring systems and online learning.	How they are identified.
	AI subject teaching	· AI curriculum, content, topic covered.	Components prescribed in curriculum.
	AI innovation	· Computer lab, innovative lab, creativity, virtual field trip.	Initiatives taken for school.
Usability: The way AI is supposed to impact on teaching and learning	Privacy	· Data privacy, information, security.	What steps need to be taken.
	AI divide	·Biased AI instruction, gender bias, digital divide, bias access. ·Equality and transparency in educational opportunities. ·Globalised social learning.	Proposed plan.
	Trustworthy AI education	·Proper evidence of AI-based learning. ·Easy to operate, true outcome.	Reports of previous studies.

4 FINDINGS AND DISCUSSION: AI IMPLEMENTATION IN THE INDIAN EDUCATION SYSTEM

Indian education system has experienced a drastic shift from conventional methods of education from the past decade (Jain et al., 2020; Suneja & Bagai, 2021; Bansal, 2022; Bargavi & Shanmugam, 2023; Karan & Angadi, 2023). The introduction of information technology into classrooms has been done through various policy measures taken by the Government of India. The thematic analysis of the policy measures has been discussed below.

4.1 AI Incorporation

Academic institutes in India have rapidly been implementing AI. The country boasts several institutions dedicated to AI, such as the Centre for Excellence in AI (CAI) at IIT Kharagpur, the Centre for AI and Robotics (CAIR) affiliated with DRDO, the Robert Bosch Centre for Data Science and AI (RBC-DSAI) at IIT Madras, AI Group (AI@IISc) at IISC Bangalore, and the Department of AI at IIT Hyderabad. In August 2021, the Government of India's Ministry of Education (MOE) collaborated with Intel and CBSE to launch "AI for All." It aimed to raise awareness among Indian citizens about artificial intelligence. The scheme 'AI for All' is a self-taught, internet-based programme. The Self-Learning Programme (SLP) includes students, professionals, and older people, and it aims to attract users with a digital-first mindset. In various educational settings, AI is beginning to show its benefits and potential, but how it will empower students regarding their performance in all areas of education has yet to be determined (Majid & Yanduri, 2022).

Use of digital technologies has been promoted at both the school and college levels. Some key initiatives include pilot studies on online learning, digital infrastructure, online teaching tools, digital content creation, 24/7 content availability, lab, teachers' training on digital learning, online examinations, blended learning models and establishing simulation standards. Several organisations, including the National Educational Technology Forum (NETF), the Central Institute of Educational Technology (CIET), the Indira Gandhi National Open University (IGNOU), the National Institute of Open Schooling (NIOS), the Indian Institutes of Technology (IITs), and the National Institutes of Technology (NITs), will be conducting pilot studies in online education. This pilot project has evaluated the integration of online learning with traditional classroom instruction. It is necessary to build a digital infrastructure with several platforms to offer online education. The platforms will guarantee technology-based remedies for issues in the public domain. Educators and learners can engage in bidirectional interactive education through e-learning management systems like DIKSHA (Digital Infrastructure for Knowledge Sharing), NPTEL (National Programme on Technology Enhanced Learning), and UGC-SWAYAM (Study the Active Learning Web for Young Aspiring Minds), among others (Waoo & Waoo, 2022).

The Central Board of Secondary Education (CBSE) in India has incorporated AI into its curriculum to equip students with the knowledge of today's rapidly evolving and demanding technology. In recent decades, India's Gross Enrolment Ratio has increased to 97% at the elementary level and 80% at the secondary level. However, low retention rates and poor learning outcomes continue to pose challenges (Bansal, 2022; Sayed et al., 2023). Nevertheless, the country remains committed to improving its educational system despite the obstacles.

4.2 AI Literacy

China has invested significantly in the education, medicine, and automotive sectors (Karan & Angadi, 2023). In 2021, profiteering services focused on public school curricula and entrance exams were banned, which has proved disastrous for China's EdTech companies. India was an alternative emerging market for investment. While funding in the Chinese education technology market fell by 75% from 2020 to 2021, and India's EdTech market increased by 60% over the same period. As one of the top emerging nations, India has also implemented EdTech and AIEd. Technology adoption in the classroom is improving, but the pace still needs to be accelerated (Sharma et al., 2023). Schools around the world spent about US $160 billion on EdTech in 2016 with projections indicating a 30% growth by 2026 (Sayed et al., 2023).

In India, the Jio revolution of 2016 allowed students in even the most remote parts of the country to access online education via their mobile phones further accelerating the growth (Mishra, 2023). These developments have reinforced the knowledge, importance and understanding of AI in education.

4.3   AI Readiness

Infrastructure readiness and access to digital resources are of primary importance to a country's preparedness factor, as this depends on its socio-economic condition and governance (Pinto & Leite, 2020). These factors are particular to the country where they originate and have irregularities. Due to inconsistencies in this domain, the literature cannot express an opinion on readiness in general or feasibility in terms of the full-scale implementation of EdTech-based systems. Preparedness is critical in a developing country such as India because variations exist within the country that can create barriers between people. This can adversely impact the inclusiveness of a venture to its full extent.

4.4   Pedagogical Approach of AI

India is undoubtedly still in a world where ICT-powered education is being promoted. Although India's education system primarily depends on a conventional classroom curriculum, recent developments in the country's educational sector demonstrate strong support for learning using EdTech (Bansal, 2022; Bargavi & Shanmugam, 2023; Charania et al., 2023; Mishra, 2023). Compared to a traditional setup, the EdTech approach offers several significant advantages. Firstly, EdTech allows individual-specific requirements and abilities to be adapted and tailored to the curriculum (Sharma et al., 2023). Second, access to educational material is facilitated for both learners and trainers through the involvement of ICT (Zainal & Zainuddin, 2020). Finally, EdTech will remove the geographic constraints of learning by enabling distance learning and teleconferencing (Bargavi & Shanmugam, 2023). Thus, it provides a structural exemption and speeds up education delivery enforcing the need for Intelligent Tutoring Systems and online learning.

4.5   AI Subject Teaching

Coursera and a MOOC platform are being used in AIEd to adapt teaching and learning methods. It will help track each student's progress and provide teachers with essential information if students encounter any difficulties in their learning content. Further, adaptive learning alters the content of lessons according to a student's needs so that they can learn at their own pace and speed. AI-powered systems are used to reduce human bias during the admissions process to higher education institutions (HEIs). Setting specific criteria to select applications for admission enhances the credibility of the process. The use of artificial intelligence tools is helping to make global classrooms available for all students, regardless of the language they speak. AI tools and programmes are inclusive, making the classroom accessible to all, irrespective of their language skills or other disabilities.

4.6   AI Innovation

The EDUSAT satellite launch was the first significant milestone in the Indian EdTech ecosystem, and it was used to create a virtual classroom in remote areas of the country using visual programmes (Bargavi & Shanmugam, 2023). Private investors entered the EdTech market in 2008, and eLearning platforms such as Extra Marks and Khan Academy became increasingly popular among Indian students (Miglani & Burch, 2019). Resultantly, EdTech began to provide successful business models for entrepreneurs in the Indian market with an extensive user base. In 2015 and 2016, this gradual increase peaked, leading to the development of an EdTech boom (Suneja & Bagai, 2021).

Notably, AI increases labour productivity and technological innovation, which results in economic growth (Bargavi & Shanmugam, 2023) consequently benefitting the nation's socio-economic goals. EdTech and ICT-driven learning would undoubtedly help India's economy expand faster by fostering the development of its human capital and increasing productivity due to technical advancements. In recent years, the Indian education sector has become a breeding ground for entrepreneurial ventures in EdTech. Both private industry and governmental initiatives are expected to increase the inclusion of EdTech in India's education system (Dhouchak & Kumar, 2023; Karan & Angadi, 2023).

4.7   Privacy

The creation, gathering, and processing of massive volumes of data about the behavior of individuals, entities, and communities is necessary for the development of AI models, solutions, and applications. Some of the challenges requiring consideration and appropriate action include data gathering without sufficient authorization, privacy of personal data, inherent selection biases and the resulting risk of discrimination and profiling, and the opaque nature of AI solutions.

However, there are worries that businesses are collecting a lot of customer data and misusing it to learn more about their customers. The consumer might not have access to these insights or be able to benefit from them. Businesses are also gaining an unfair competitive advantage by accumulating big data collections (NITI Aayog, 2018). This has lead to privacy concerns for consumers but adequate government responses could not be located.

4.8   AI Divide

In 2005, the Indian National Curriculum Framework's position statement on the "Aims of Education" emphasised that education is a socially transformative endeavour that helps achieve the goals set out in the constitution, including creating a fair, equitable, and just society for future generations.

It is crucial to comprehend the state of Information Communication Technology (ICT) programmes in schools to examine the introduction of AI in Indian schools. Private sector schools have embraced ICT, but in most Indian states, the Government of India's ICT@School initiative has proven ineffective. The National Education Policy (NEP)-2020 aims to achieve Sustainable Development Goal (SDG) 4, providing citizens with quality education. The policy emphasises enhancing learning outcomes through customisation, content availability, and international operations. It suggests refurbishing and reintroducing e-learning platforms like SWAYAM and DIKSHA to make the system more "student-centric." Additionally, it proposes using standardised multimedia platforms such as radio and television to provide educational content to the general population (NEP, 2020). EdTech effectively imparts curricula in schools, but its successful implementation requires discussing preparedness parameters within the Indian socio-economic framework.

Providing necessary workforce skills to the youth in India can prove to be a demographic advantage as good education is essential for the demographic dividend. However, inadequate infrastructure, low government spending on education (less than 3.5% of GDP), and a nationwide 24:1 student-teacher ratio in elementary schools still pose significant challenges (UDISE+, 2021). Thus, the Indian

educational system must be adjusted to meet international standards and implement cutting-edge, pertinent, and responsive teaching methods.

4.9 Trustworthy AI Education

Trustworthy AI education involves ease in operability and evidences of AI based learning for better outcomes. NITI Aayog's "Responsible AI" of 2021 highlighted education as one area where artificial intelligence has great potential to address societal needs. It also emphasises the potential of AI to improve learning outcomes. It predicts that intervention may be needed to reduce young people's dropout rates by providing individualised training and helping to anticipate these needs. AI has much potential to improve education and learning outcomes, according to a report by NITI Aayog. Individualised training and prediction of students' needs can help reduce the number of dropouts. AIEd makes learning available to all students, regardless of location or physical ability. It also helps teachers identify gaps in teaching and content (Gope et al., 2021). This has consequently made AIEd easy to operate and outcome oriented.

5 BENEFITS FOR TEACHERS AND STUDENTS

Currently, public and private-funded TEL programs are available in India. India is among the top three countries in the world, after China and the United States, in terms of getting venture capital funding in the sector (Ministry of Human Resource Development, 2015). Inclusion of AI in Education holds several benefits for all stakeholders alike.

The primary benefits of using AI for teachers include

(1) To improve the teacher's ability to teach and help him prepare for the topic or lesson taught in the classroom.

(2) To allow for an immediate and innovative assessment of the student's learning outcomes.

(3) To help the teacher understand his teaching methods and suggest ways to improve them.

(4) Teachers can use artificial intelligence tools to give personalised guidance to their students.

(5) To assist teachers with classroom management, taking attendance and keeping digital records.

(6) To help create and present information to students.

AI's unparalleled potential can completely change the education industry. Additionally, students can benefit from its prowess, as covered in the points below

(1) To enhance students' motivation and participation.

(2) To provide students with specialised training and feedback based on their personalities.

(3) For improved classroom freedom as AI programmes do not refuse to answer prompts. The students can, therefore, ask multiple questions. Interacting with a machine will also decrease hesitance among students when raising a query.

(4) Students can learn at their speed because there is no fixed period.

(5) To facilitate the exchange of learning between students.

(6) To provide students with knowledge of technology.

(7) Improved accessibility to education as increased digital penetration can facilitate AI to reach a broader audience.

Despite its benefits, however, there is a great deal of concern that AI will be able to replace physical teachers for teaching purposes in the future (Jain et al., 2020; Charnia et al., 2023). Interventions are required in the overall development of students because some skills, such as social competencies, emotional intelligence, ethics, humanity, and compassion, need to be taught by humans (Dogan et al., 2023; Sayed et al., 2023).

6 THE FUTURE AHEAD FOR AI IN EDUCATION IN INDIA

The Indian education system presents several obstacles, notwithstanding its distinctiveness and expansion at all levels. AI undoubtedly has the potential to lessen the formal education system's burden and help our educational system overcome some of its obstacles. Furthermore, the Indian education system's language barriers can be addressed through AI. In curriculum development, AI tools can be applied to research data analysis of education issues, which will improve the capacity of teachers, managers and policymakers. To increase the employability of our youth, some new courses in machine learning, the Internet of Things (IoT), data mining and robotics should be introduced, and existing courses need to be re-evaluated. Digital infrastructure and content will be supported by establishing a unit on digital and online learning. The Ministry of Human Resources Development handles all requirements for higher education and schooling related to electronic learning. Given the increasing number of pandemics and epidemics, we shall develop recommendations to promote online learning as a quality educational option.

7 CONCLUSION

Artificial Intelligence in Education (AIEd) integrates computer science, psychology and learning to strengthen support for artificial intelligence in educational technology. It tangles the applicability of various AI technologies to facilitate and maximise participation in the teaching-learning process. Traditionally, the classroom has been a formal setting where learning methods are taught and implemented by a practical implementation teacher using many teaching techniques. With the advent of AI, teachers can take advantage of it as a friend or tutor in formal classroom learning processes, using which they can rethink all aspects of education.

In India, most schools still need more fundamental infrastructure, such as power supply, and digital education is still a long way from becoming universal. As a result of the Indian government's and the state's Open Educational Resources (OER) programmes such as Diksha and the National Repository of Open Educational Resources (NROER), there has been a steady increase in the availability of digital curriculum content.

The amount of available digital data regarding student interactions is small when there is no significant ICT integration in the classroom. Nonetheless, there are projects in the commercial sector that want to gather student data via their platforms and apps. For example, Byju's asserts that it offers customised learning routes derived from learner context analysis. Both Google and Microsoft are analysing school dropout statistics in Andhra Pradesh. Google works with Vishakhapatnam Corporation schools, while Microsoft works with the state government. The importance of interactive in-person academics is significant in Digital Learning. In the future, various effective blended learning models are

expected to be developed in this area. The future of education is ICT-powered learning.Introduction

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TRANSFORMAR I REFORMAR EL SISTEMA EDUCATIU INDI AMB INTEL·LIGÈNCIA ARTIFICIAL

El sector de l'educació i la tecnologia de l'Índia ha crescut de manera exponencial durant els darrers anys, especialment en temps de pandèmia de Covid-19 per diverses raons, inclosa la seva participació important en la revolució de la intel·ligència artificial (IA). La IA ha demostrat ser útil per a totes les parts interessades per (a) millorant l'eficiència i l'eficàcia dels professors i permetent el desenvolupament automatitzat de continguts docents personalitzats; (b) adaptar els materials d'aprenentatge al nivell de competència, estil i ritme d'aprenentatge dels estudiants per millorar la interactivitat i les taxes d'atenció; i (c) per a sistemes efectius de publicació i transferència de professors i predir activitats probables dels estudiants, com ara les taxes d'abandonament escolar a les escoles governamentals. La investigació ofereix una revisió exhaustiva de la inclusió rigorosa de l'AI al sector educatiu de l'Índia mitjançant diverses mesures polítiques. El document realitza una anàlisi temàtica de les dades secundàries com ara documents i notificacions governamentals. El model de Karan i Angadi s'ha adaptat per descriure els temes, subtemes i estratègies d'integració de la IA a l'educació. Segons les conclusions, AI augmenta l'eficiència de la qualificació i fomenta el pensament crític i les habilitats analítiques entre els estudiants. Estudis posteriors poden avaluar l'efectivitat en la integració de la IA en diversos altres camps, com ara ciutats intel·ligents i infraestructures, mobilitat i transport, sector sanitari i agricultura.

PARAULES CLAU: Pensament crític, sistema educatiu indi, revisió sistemàtica, intel·ligència artificial a l'educació (AIED), EdTech, aprenentatge personalitzat

TRANSFORMAR Y REFORMAR EL SISTEMA EDUCATIVO INDIO CON INTELIGENCIA ARTIFICIAL

El sector de la educación y la tecnología de la India ha crecido de forma exponencial durante los últimos años, especialmente en tiempos de pandemia de Covid-19 por diversas razones, incluida su participación importante en la revolución de la inteligencia artificial (IA). La IA ha demostrado ser útil para todas las partes interesadas por (a) mejorando la eficiencia y la eficacia de los profesores y permitiendo el desarrollo automatizado de contenidos docentes personalizados; (b) adaptar los materiales de aprendizaje al nivel de competencia, estilo y ritmo de aprendizaje de los estudiantes para mejorar la interactividad y las tasas de atención; y (c) para sistemas efectivos de publicación y transferencia de profesores y predecir actividades probables de los estudiantes, tales como las tasas de abandono escolar en las escuelas gubernamentales. La investigación ofrece una revisión exhaustiva de la inclusión rigurosa del AI en el sector educativo de la India mediante diversas medidas políticas. El documento realiza un análisis temático de los datos secundarios como documentos y notificaciones gubernamentales. El modelo de Karan y Angadi se ha adaptado para describir los temas, subtemas y estrategias de integración de la IA en la educación. Según las conclusiones, AI aumenta la eficiencia de la calificación y fomenta el pensamiento crítico y las habilidades analíticas entre los estudiantes. Estudios posteriores pueden evaluar la efectividad en la integración de la IA en otros campos, como ciudades inteligentes e infraestructuras, movilidad y transporte, sector sanitario y agricultura

PALABRAS CLAVE: Pensamiento crítico, sistema educativo indio, revisión sistemática, inteligencia artificial en la educación (AIED), EdTech, aprendizaje personalizado