

***ARTIFICIAL INTELLIGENCE IN EDUCATION:
A COMPARATIVE STUDY OF INDIA, BRAZIL, AND SOUTH AFRICA***

Heema Padmani
BA (Political Science) Student
L. D. Arts College
Department Of Political Science
Gujarat University, Ahmedabad

ABSTRACT:

AI education is a broad research area that studies how artificial intelligence is used to support teaching and learning, and how learners and teachers develop AI literacy and skills. It covers both “AI in education” (using AI tools in classrooms) and “education about AI” (teaching how AI works and its implications). This study undertakes an international comparative case analysis of India, Brazil, and South Africa to examine how developing nations are integrating Artificial Intelligence into their education systems. In developing countries, access to and use of AI generative technologies may be limited due to a lack of financial opportunities, well-functioning infrastructure, and teachers' skills in using AI as an educational tool. Yet, AI generative technologies are a reality that cannot be ignored. In the realm of education, AI offers many opportunities and challenges in teaching and learning. However, the effectiveness of AI integration depends on policy coherence, infrastructural readiness, and institutional capacity within national education systems. This study adopts a qualitative comparative case study approach to analyze AI integration in education systems of India, Brazil, and South Africa, with a focus on policy orientation, equity concerns, and governance frameworks.

Keywords: Artificial intelligence, Developing Nations, Comparative study.

INTRODUCTION:

The traditional “one size fits all” education system has been largely criticized in recent years on the ground of its lacking the capacity to meet individual student needs. Global education systems are leaning towards a more personalized, student-centered approach. Innovations like Big Data, Machine Learning, and Artificial Intelligence (AI) have given the

modern-day technology to accommodate the distinctive features of human beings. In education, AI is increasingly used to support personalized learning, assessment, and administrative efficiency. The current global scenario is showing how the developing countries are putting their efforts to combat the challenges in their way to transform traditional educational systems into AI driven education systems.

CASE STUDY: INDIA

India's education system is usually described as large, diverse, and exam-driven but it is currently in the transition phase because of the National Education Policy (NEP) 2020. National Education Policy (NEP) 2020 explains the shift from 10+2 to 5+3+3+4 along with emphasizing digital literacy, computational thinking, online learning platforms and use of Artificial Intelligence (AI) for “better teaching, learning and evaluation” across school and higher education. The Government has decided to introduce a formal curriculum on AI and computational thinking, aligned with NEP 2020 and the National Curriculum Framework for School Education 2023. Policy papers argue that AI could especially support first-generation learners and remote areas through low cost digital tools, but it warns that poor connectivity, device gaps and biased algorithm can deepen inequality if not addressed. The sudden change in the existing system and making available the AI education at the each end of the country would be an administrative challenge along with the question of issues like poverty and social and economic inequality. However, the integration of AI has become increasingly necessary to prepare India's youth for emerging global technological and economic challenges. The COVID-19 pandemic accelerated the adoption of technology-enabled education across institutions. Digital Platforms such as DIKSHA and SWAYAM supported AI-assisted learning and teacher training. However concerns regarding data privacy, algorithm bias, ethical use of AI and digital tools and Infrastructure constraints remains as a point of concern.

CASE STUDY: BRAZIL

Brazil presents a comparable Global South contexts where federal governance, social inequality and Digital reforms initiatives shape the adoption of Artificial Intelligence (AI) in education. It has a large and decentralized education system, governed under a federal structure involving the Union, States and Municipalities. Public education dominates with the ongoing reforms aimed at improving digital literacy and learning outcomes. Brazil's approach towards AI-driven education focuses on ethical regulation, public school projects and teachers support tools; with less aggressive curriculum mandates (compared to India) but

a strong private and government initiatives. The country's shift from traditional teacher-led learning to AI-driven education remains incremental and regulated, driven by public projects, EDtech and strict governance rather than a sudden overhaul. The Ministry of Education supports digital inclusion and technology integration initiatives. An example of AI-supported education in Brazil is the use of adaptive learning platforms accredited by the Ministry of Education, which aim to provide personalized learning experiences at scale. In Brazil, COVID-19 pandemic accelerated the use of digital tools and remote learning technologies. Digital transformation, widely recognized as a reality in the Brazilian public sector, involves the introduction and adoption of technological innovations to optimize Government services provided to the population (*Filgueiras et al., 2019; Montero 2020*). The regulation of use of AI in Brazil, approved by the Senate in December 2024, marks a significant step forward for a country facing challenges such as unequal access to technology. Brazil faces several structural and practical challenges in implementing AI-driven education like Digital infrastructural gaps, Ethical issues, Regulatory challenges and Equity hurdles. But the Brazilian experience highlights the importance of institutional coordination and ethical oversight.

CASE STUDY: SOUTH AFRICA

South Africa presents a distinctive case for examining the integration of Artificial Intelligence (AI) in education within a developing country, context shaped by historical inequality and socio-economic transformation. This case studies the efforts and challenges faced a developing country, dealing with extreme inequality. The integration of AI into education in South Africa is apart of a broader trend towards digital transformation. The utilization of AI in Higher educational institutions of South Africa presents promising solutions to unique challenges; such as resource constraints, diverse student populations and the need for increased access and equity. Furthermore, the South African Higher education landscape is characterized by a complex array of public universities, private institutions and technical and vocational education and training (TVET) colleges, all of which are tasked with not only providing quality education but also addressing socio-economic disparities and contributing to National development (*Technium Education and Humanities Vol.9, pp 51-65 [2024]*). South Africa's Policy Framework for AI-driven education is guided by the draft National AI Policy Framework (*released on October 2024, by the Department of Communications and Digital technologies*), which emphasizes human-centric AI with education as a core pillar, among the 12 strategic pillars. Backed by market forecasts that

predict rapid growth in K12 AI solutions, the practical takeaway for the South Africa is to plan for scaled, equity-focused rollouts that pair teacher training with affordable, locally relevant AI tools. It posits that AI can significantly enhance educational outcomes and administrative efficiency in South Africa Higher education institutions, but successful integration necessitates addressing infrastructure limitations, ethical concerns and strategic Frameworks. As AI reaches into the everyday personal and professional lives of South Africans, the country's education system is at a crossroad, as the immense potential of the technology is overshadowed by barriers like spotty internet, power outages and outdated resources.

COMPARATIVE ANALYSIS: INDIA, BRAZIL, AND SOUTH AFRICA

The three case studies highlight both common challenges and context-specific approaches in the adoption of AI within education systems. While all three countries recognize AI as a transformative tool for improving educational access, quality, and efficiency, their approaches differ in terms of policy design, governance structures, implementation strategies, and ethical priorities.

Policy Orientation and Strategic Vision:

India adopts a policy-driven and reform-oriented approach, with AI integration embedded within the broader framework of the National Education Policy (NEP) 2020 and the National Curriculum Framework for School Education 2023. The Indian case reflects a strong emphasis on systemic restructuring, curricular reform, and early exposure to AI and computational thinking. In contrast, Brazil follows a strategy-based and regulatory approach, where AI in education is guided by the Brazilian Artificial Intelligence Strategy (EBIA) and sector-specific digital transformation initiatives rather than direct curriculum mandates. South Africa occupies a middle position, emphasizing ethical governance and human-centric AI, with AI in education framed within broader digital transformation and social justice objectives outlined in its draft National AI Policy Framework.

Governance Structures and Implementation Mechanisms:

All three countries operate under decentralized or federal governance systems, which significantly shape AI implementation outcomes. In India and Brazil, education governance is shared between central and subnational governments, resulting in uneven adoption of AI tools across states and regions. South Africa's national-provincial structure similarly leads to

disparities in implementation, particularly between historically advantaged and disadvantaged institutions. Across all cases, the lack of uniform institutional capacity and coordination emerges as a key constraint on large-scale AI deployment in education.

Access, Infrastructure, and Digital Divide:

A significant digital divide is a shared structural challenge across India, Brazil, and South Africa. In India, the scale and diversity of the population amplify issues related to connectivity, device availability, and teacher readiness. Brazil and South Africa face stark inequalities rooted in income disparities and historical exclusion. While AI is frequently presented as a tool for expanding access and supporting marginalized learners, all three case studies caution that inadequate infrastructure and uneven digital readiness risk reinforcing existing educational inequalities.

Teacher Preparedness and Institutional Capacity:

Teacher training and institutional capacity emerge as critical bottlenecks in all three contexts. India faces challenges in providing large-scale AI-related teacher training across its vast education system. Brazil's decentralized structure results in uneven professional development opportunities, while South Africa struggles with skills shortages and resource constraints, particularly in rural and underfunded institutions. The cases collectively highlight that successful AI integration depends not only on technology but also on sustained investment in human capital.

Comparative Insights and Key Findings:

Despite contextual differences, the three cases reveal several common patterns. AI adoption in education remains incremental, uneven, and policy-led, rather than transformative at scale. Structural inequalities, governance fragmentation, and capacity limitations significantly influence outcomes across all contexts. At the same time, the experiences of India, Brazil, and South Africa demonstrate that AI can play a meaningful role in enhancing educational delivery when aligned with inclusive policies, ethical safeguards, and local realities. Collectively, these case studies underscore the need for context-sensitive, equity-focused, and ethically grounded approaches to AI-enabled education in the Global South.

LITERATURE REVIEW:**Artificial Intelligence and Education:**

Artificial Intelligence has increasingly been discussed in educational literature as a tool that can support teaching and learning processes. Scholars suggest that AI can help in personalized learning, automated evaluation, and educational planning by using data-based systems. Many studies highlight that AI is not meant to replace teachers but to assist them in managing large classrooms and diverse learning needs. Overall, the literature conceptualizes AI as a complementary tool that enhances educational efficiency while maintaining the central role of teachers.

AI in Education in Developing Countries:

Research on AI in education in developing countries points out that while AI has strong potential, its application is shaped by economic and infrastructural realities. Studies note that limited digital infrastructure, lack of trained teachers, and unequal access to technology restrict the full use of AI tools. Scholars also argue that without inclusive planning, AI can widen existing educational inequalities rather than reduce them. As a result, policy-led and gradual implementation is commonly observed in developing nations.

Literature on India:

In the Indian context, literature focuses mainly on government initiatives such as the National Education Policy 2020 and Digital India. Researchers observe that India sees AI as a solution to problems such as large student populations, shortage of teachers, and uneven quality of education. Studies discuss the use of digital platforms, online learning tools, and AI-based skill development programs. However, literature also highlights challenges such as poor internet connectivity in rural areas and differences in digital literacy across regions.

Literature on Brazil:

Studies on Brazil show that AI in education is often linked to innovation and technological modernization. Scholars note that Brazil encourages pilot projects and partnerships with private technology firms to introduce AI-based tools in education. Literature points out that these initiatives aim to improve learning quality and administrative efficiency. At the same time, researchers highlight that social and regional inequalities affect the reach of AI technologies, especially in remote and low-income areas.

Literature on South Africa:

In South Africa, literature on AI in education is strongly connected to issues of inequality and social justice. Researchers emphasize that AI policies in education stress ethical use, fairness, and inclusion. Studies discuss how historical inequalities continue to affect access to digital education tools. Although policy documents recognize AI's potential, literature suggests that limited infrastructure and uneven institutional capacity slow down effective implementation.

Methodology:

This study employs a qualitative comparative case study methodology to analyze the adoption of Artificial Intelligence in education in India, Brazil, and South Africa. The research is based on secondary data drawn from national education and AI policy documents, government initiatives, and reports by international organizations referenced within the case studies. The analysis focuses on policy objectives, implementation strategies, equity concerns, and governance mechanisms related to AI in education. This qualitative approach is suitable for examining policy frameworks and institutional contexts, though the study is limited by its reliance on secondary data sources.

Findings And Discussions:

This comparative case study of India, Brazil, and South Africa reveals important patterns in the adoption and governance of Artificial Intelligence (AI) in education across Global South contexts. While each country operates within distinct political, institutional, and socio-economic frameworks, several shared findings emerge regarding policy orientation, implementation strategies, equity concerns, and ethical governance.

Policy-Driven Adoption of AI in Education: A key finding across all three cases is that AI integration in education is largely state-led and policy-driven, rather than market-driven alone. India's National Education Policy (NEP) 2020 and the National Curriculum Framework for School Education 2023 explicitly position AI and computational thinking as foundational skills, embedding them within formal curricula from early grades. Similarly, Brazil's Brazilian Artificial Intelligence Strategy (EBIA) provides a national framework that includes education as a critical sector for AI development. In South Africa, the draft National AI Policy Framework emphasizes a human-centric approach, recognizing education as a core

pillar of national AI strategy. This reflects an active role of the state in shaping AI adoption in line with national educational priorities.

Gradual and Incremental Implementation:

Despite ambitious policy frameworks, the actual implementation of AI in education across the three countries remains incremental and uneven. India has introduced many AI-enabled digital platforms yet the large-scale classroom integration is constrained by infrastructural disparities. Brazil's approach is more cautious and regulated, focusing on pilot projects, teacher-support tools, and adaptive learning platforms rather than sweeping curricular mandates. Similarly, South Africa demonstrates selective adoption, with AI primarily used for administrative automation, personalized learning pilots, and on-demand tutoring in higher education institutions. This finding suggests a clear gap between policy aspiration and institutional capacity, highlighting the practical challenges of scaling AI technologies within resource-constrained education systems.

Ethical Governance and Regulatory Awareness:

Another important finding is the growing emphasis on ethical governance of AI in education across all three countries. Concerns related to data privacy, algorithmic bias, transparency, and accountability are explicitly acknowledged in policy discussions in India, Brazil, and South Africa. Brazil stands out for its comparatively advanced regulatory engagement, with legislative approval of AI governance frameworks and stronger institutional oversight mechanisms. India and South Africa, while recognizing ethical risks, are still in the process of translating ethical principles into enforceable regulatory practices. This reflects an increasing awareness among Global South policymakers that ethical oversight is not a secondary concern but a foundational requirement for sustainable AI integration in education.

Role of Teachers and Institutional Capacity:

The findings also indicate that teacher preparedness and institutional capacity are decisive factors in successful AI adoption. India and South Africa face significant challenges related to limited teacher training in AI and digital tools, whereas Brazil places greater emphasis on teacher-support technologies rather than curriculum-wide AI instruction. Across all three cases, AI is increasingly framed as a tool to reduce administrative burdens and enable personalized learning, thereby allowing teachers to focus on mentorship and critical

thinking. However, without systematic capacity-building and professional development, AI integration risks remaining superficial or uneven.

Comparative Insight and Broader Implications:

Taken together, the comparative analysis demonstrates that India, Brazil, and South Africa are pursuing context-sensitive, development-oriented AI strategies in education rather than replicating models from developed economies. While differences exist in governance structures and implementation speed, the shared focus on inclusion, ethical use, and public-sector leadership highlights a distinctly Global South approach to AI-enabled education. The findings suggest that successful AI integration in developing countries depends not merely on technological availability but on coordinated policy design, infrastructure investment, ethical regulation, and human capacity development. These experiences offer valuable lessons for other developing nations seeking to leverage AI for educational transformation while safeguarding equity and social justice.

Conclusion:

This study examined the integration of Artificial Intelligence in education through a comparative case analysis of India, Brazil, and South Africa, three developing countries representing diverse Global South contexts. The findings demonstrate that while AI holds significant potential to transform educational systems by enhancing access, personalization, and administrative efficiency, its successful adoption is deeply shaped by national socio-economic conditions, governance structures, and institutional capacities. Across all three cases, AI integration in education is predominantly policy-driven, reflecting strong state involvement in aligning technological innovation with broader educational and developmental objectives. National frameworks such as India's National Education Policy 2020, Brazil's Brazilian Artificial Intelligence Strategy, and South Africa's draft National AI Policy Framework highlight education as a strategic domain for AI deployment. However, the translation of policy ambition into effective practice remains uneven, constrained by infrastructural limitations, digital divides, and gaps in human capacity. A central conclusion of this study is that AI in education does not automatically promote equity. Instead, without targeted interventions, AI risks reinforcing existing inequalities related to connectivity, access to digital devices, and institutional resources. The experiences of India, Brazil, and South Africa underscore the need for inclusive, equity-focused implementation strategies that prioritize marginalized communities and under-resourced institutions.

Finally, the study concludes that teachers and educational institutions remain central to the effective integration of AI. Rather than replacing educators, AI functions most productively as a supportive tool that enables personalized learning, reduces administrative burdens, and enhances pedagogical innovation. Sustained investment in teacher training, digital literacy, and institutional capacity-building is therefore essential. In sum, the comparative experiences of India, Brazil, and South Africa reveal that AI-enabled education in developing countries is best understood as a gradual, context-specific process rather than a technological quick fix. These cases offer valuable insights for other Global South nations seeking to harness AI for educational transformation while maintaining commitments to equity, ethics, and inclusive development. Future research may focus on empirical classroom-level studies to assess the actual pedagogical impact of AI tools on student learning outcomes in developing countries.

REFERENCES:

- Government of India. (2020). National Education Policy 2020. Ministry of Education.
- Government of India. (2023). National Curriculum Framework for School Education. Ministry of Education.
- UNESCO. (2021). Education in a post-COVID world: Nine ideas for public action. UNESCO Publishing.
- Rech, I., Silva, L., & Gomes, R. (2023). Digital education policies and remote learning during the COVID-19 pandemic. *International Journal of Educational Development*, 97, 102703.
- Filgueiras, F., Flávio, C., & Palotti, P. (2019). Digital transformation and public service delivery in Brazil. *Government Information Quarterly*, 36(4), 101395.
- Montero, A. P. (2020). Digital governance and public sector innovation in Brazil. *Public Administration Review*, 80(6), 1025–1035.
- Senate of Brazil. (2024). Brazilian Artificial Intelligence Strategy (EBIA). Government of Brazil.
- Department of Communications and Digital Technologies. (2024). Draft National Artificial Intelligence Policy Framework. Government of South Africa.
- Technium Education and Humanities. (2024). Artificial intelligence and higher education transformation in South Africa. *Technium Education and Humanities*, 9, 51–65.