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A Comparative Review of Maturity, Governance, and Human-Centered Alternatives: Artificial Intelligence in Education

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Abstract: *The integration of Artificial Intelligence (AI) into school education systems has accelerated globally, driven by promises of personalization, efficiency, and scale. However, the rapid adoption of AI has raised significant concerns regarding equity, transparency, data protection, teacher autonomy, and child rights (Williamson, 2017; UNESCO, 2021). This review article examines AI in school education through a maturity framework, comparing governance approaches across countries with a particular focus on India. It situates AI-enabled education alongside non-AI and human-centered educational practices, arguing that technological sophistication alone does not constitute progress (Biesta, 2010). Drawing on international norms such as UNESCO's human-centered AI principles and OECD governance frameworks, the article highlights the risks in privatization, surveillance, and inequality, while proposing a public-interest, rights-based pathway for AI use in education.*

Introduction

In the Indian context, the National Education Policy 2020 (NEP 2020) provides an important normative framework for understanding the integration of technology in education. NEP 2020 emphasizes equitable access, digital inclusion, capacity building of teachers, and the ethical use of technology to enhance learning outcomes rather than replace human engagement. It calls for the promotion of critical thinking, experiential learning, and holistic development, while also encouraging the responsible adoption of emerging technologies such as Artificial Intelligence. The policy underscores that technology should serve as an enabler within a learner-centered, inclusive, and publicly accountable education system, aligning closely with human-centered and rights-based approaches to AI governance in education.

Education systems worldwide are increasingly adopting AI-based tools for teaching, assessment, administration, and student monitoring (Luckin et al., 2016). These developments are often framed as inevitable responses to scale, efficiency demands, and learning gaps. Yet, education is not merely a technical system; it is a social, cultural, and ethical institution deeply connected to democratic values and human development (Dewey, 1916).

Historically, schooling has relied on human-centered methods—teacher judgment, contextual pedagogy, and relational learning (Freire, 1970). The introduction of AI represents not only a technological shift but a governance challenge, raising questions about who controls educational processes, how decisions are made, and whose interests are prioritized (Selwyn, 2019).

In reference to the National Education Policy 2020 and in continuation of its vision for responsible technology integration, it is also important to prioritize educational technologies in alignment with guidance from leading national and international bodies such as UNESCO, UNICEF, Commonwealth Educational Media Centre for Asia (CEMCA), and NITI Aayog. These institutions emphasize equity, inclusion, accessibility, child protection, digital public goods, and ethical AI governance in education. Prioritizing educational technologies within this framework ensures that innovation remains pedagogically grounded, publicly accountable, and aligned with constitutional values, while safeguarding learner data, strengthening teacher agency, and reducing digital divides rather than deepening them.

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Conceptual Framework: Maturity in Educational Technology

Defining Maturity Beyond Technology

AI maturity in education is often understood as the degree of automation or algorithmic sophistication. This review adopts a broader conception, where maturity reflects governance quality rather than technological intensity (OECD, 2019). Key indicators include:

- Alignment with human rights and child protection (UNESCO, 2021)
- Transparency and explainability of systems (Doshi-Velez & Kim, 2017)
- Teacher participation and professional autonomy (Biesta, 2015)
- Public accountability and democratic oversight (Yeung, 2018)
- Equity and inclusion across social groups (Eubanks, 2018).

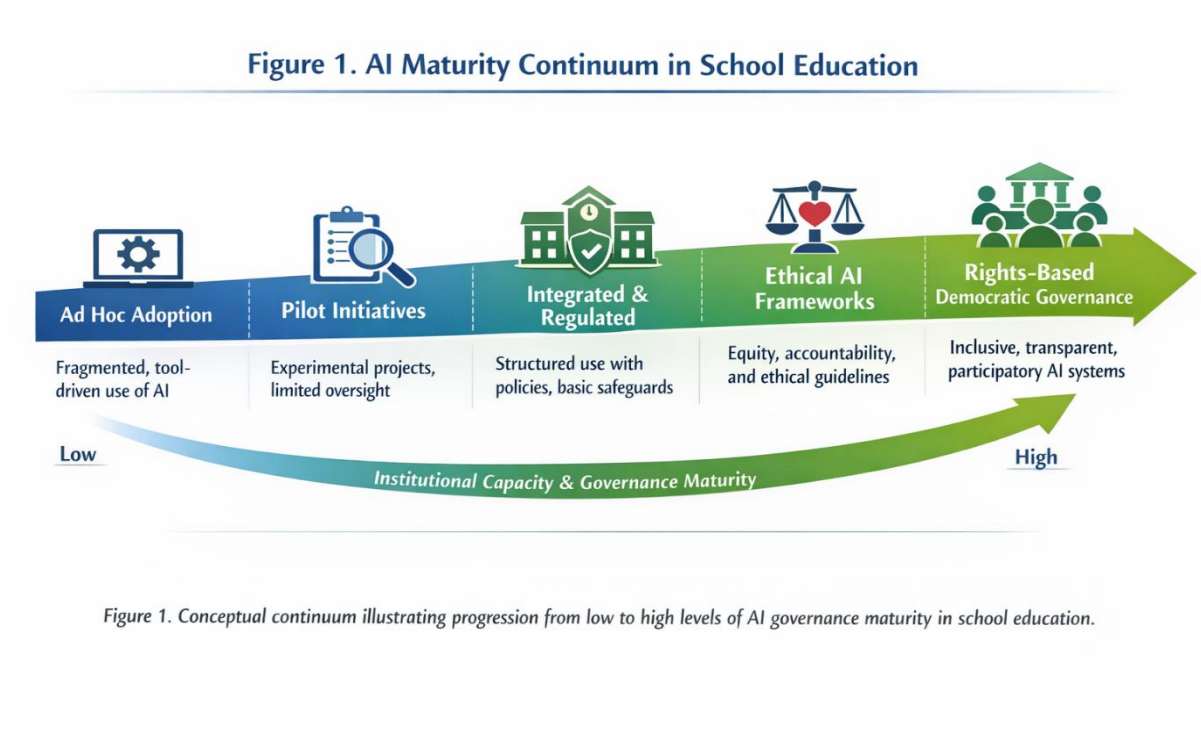


Figure 1. Conceptual continuum illustrating progression from low to high levels of AI governance maturity in school education.

Table 1. AI Maturity Levels in School Education

Maturity Level	Core Characteristics	Governance Quality	Role of AI
Level 1: Ad Hoc	Pilot projects, vendor-led adoption	Minimal	Experimental, unregulated
Level 2: Digitally Enabled	Basic digital tools, limited safeguards	Low	Efficiency-focused
Level 3: Policy-Aligned	Guidelines and standards exist	Moderate	Supportive but uneven
Level 4: Accountable	Audits, transparency, redress mechanisms	High	Human-in-the-loop
Level 5: Rights-Based	Democratic oversight, equity-centered	Very High	Augmentative, public-interest

●Source: Author's synthesis based on UNESCO (2021) and OECD (2019).

Under this framework, a system with limited or no AI may be more mature than a highly automated system lacking safeguards

Human-Centered vs AI-Augmented Education

Traditional (non-AI) education systems rely on teacher-led instruction, formative assessment, and social learning (Vygotsky, 1978). AI-augmented systems introduce personalized learning platforms, automated assessments, and predictive analytics (Luckin et al., 2016). Research cautions that AI should augment rather than replace pedagogical judgment (Holmes et al., 2022).

Table 2. Comparison of AI and Non-AI (Human-Centered) Educational Approaches

Dimension	Human-Centered (Non-AI)	AI-Augmented Education
Pedagogical control	Teacher-led	Algorithm-assisted
Assessment	Formative, contextual	Automated / predictive
Transparency	High (human judgment)	Often limited (black-box)
Equity impact	Depends on resources	Risk of amplifying bias
Accountability	Clear human responsibility	Diffused between actors
Student autonomy	Relational, dialogic	Risk of monitoring/surveillance

Global Approaches to AI in School Education

Pedagogy-Led Public Models

Countries such as Finland emphasize restrained and transparent AI use, prioritizing teacher autonomy and public digital infrastructure (Sahlberg, 2015). AI tools remain optional and aligned with curricular goals rather than efficiency metrics.

Market-Driven Models

In the United States, AI adoption is driven largely by private EdTech firms (Williamson et al., 2020). While innovation is rapid, governance remains fragmented, resulting in uneven data protection, increased surveillance, and widening inequalities (O'Neil, 2016).

Table 3. Cross-National Comparison of AI Governance in School Education

Country	Governance Model	Equity Orientation	Transparency	Surveillance Risk
Finland	Pedagogy-led public	High	High	Low
United Kingdom	Regulated market	Medium	Medium	Medium
United States	Market-driven	Low	Low	High
China	State-led scale	Medium	Low	Very High
India	Public-first (aspirational)	Medium	Low–Medium	Medium–High

State-Led Scale Models

China demonstrates large-scale AI deployment in education supported by strong infrastructure (Zhao et al., 2021). However, limited transparency and extensive student monitoring raise concerns regarding privacy, autonomy, and long-term social consequences (Feldstein, 2019).

India's Hybrid Position

India occupies an intermediate position, combining strong constitutional commitments to equity with limited enforcement capacity (Kumar, 2020). AI adoption is expanding through public programs and private vendors, while governance frameworks remain fragmented.

India: AI, Education, and Public Governance

Policy Intent and Institutional Context

India's Right to Education Act and the National Education Policy (NEP 2020) emphasize inclusivity, quality, and technology-enabled learning (Government of India, 2020). However, AI-specific regulation in school education remains underdeveloped.

Key Challenges

- Digital Divide: AI disproportionately benefits urban and private schools (ASER, 2022).
- Data Governance: Student data collection often lacks meaningful consent and transparency (Ramanathan, 2021).
- Teacher Marginalization: Automated systems risk reducing professional autonomy (Biesta, 2015).
- Surveillance Practices: Monitoring tools normalize behavioural tracking of children (Selwyn, 2019).

Table 4. Key Risks of AI in School Education (India-Focused)

Risk Category	Description	Implications
Digital divide	Unequal access to devices and connectivity	Exclusion of rural and marginalized students
Data exploitation	Commercial use of student data	Loss of privacy, public trust
Surveillance	Monitoring of attendance and behaviour	Chilling effects on autonomy
Teacher deskilling	Automation-first design	Reduced professional judgment

Comparison with Non-AI Alternatives

Many outcomes attributed to AI—personalization, feedback, inclusion—have historically been achieved through investments in teacher training, smaller class sizes, and community engagement (Hattie, 2009). AI should complement, not substitute, these approaches.

Transparency, Explainability, and Accountability

Opaque AI systems undermine trust and prevent effective redress (Burrell, 2016). Explainability is essential when AI affects assessment, learning pathways, or access to opportunities (Doshi-Velez & Kim, 2017). Transparency must be understood as a democratic requirement, not merely a technical feature (Yeung, 2018).

Ethical and Political Economy Considerations

AI adoption in education reflects broader political–economic structures. Market-driven systems prioritize scalability and data extraction, risking the commercialization of public education (Williamson, 2017; Eubanks, 2018). Alternative approaches emphasize public ownership, open-source systems, and cooperative governance models (Mazzucato, 2018).

Toward a Rights-Based Maturity Model

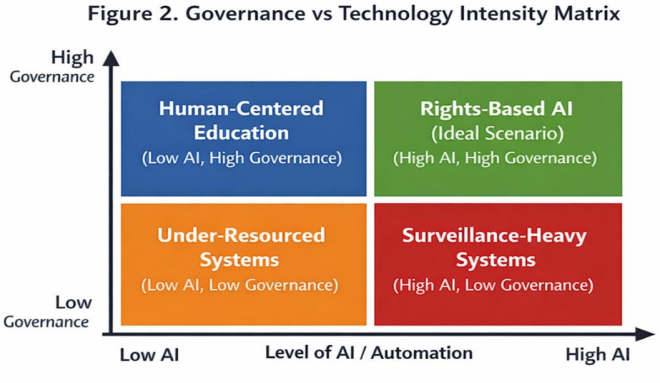


Figure 2. *Relationship between AI intensity and governance quality in school education.*

High maturity in AI-enabled education systems requires:
1.Human rights and child impact assessments (UNESCO, 2021)
2.Teacher-in-the-loop decision-making (Holmes et al., 2022)
3.Rights to explanation and appeal (Yeung, 2018)
4.Independent public oversight (OECD, 2019)
Treatment of student data as a public trust (Eubanks, 2018)

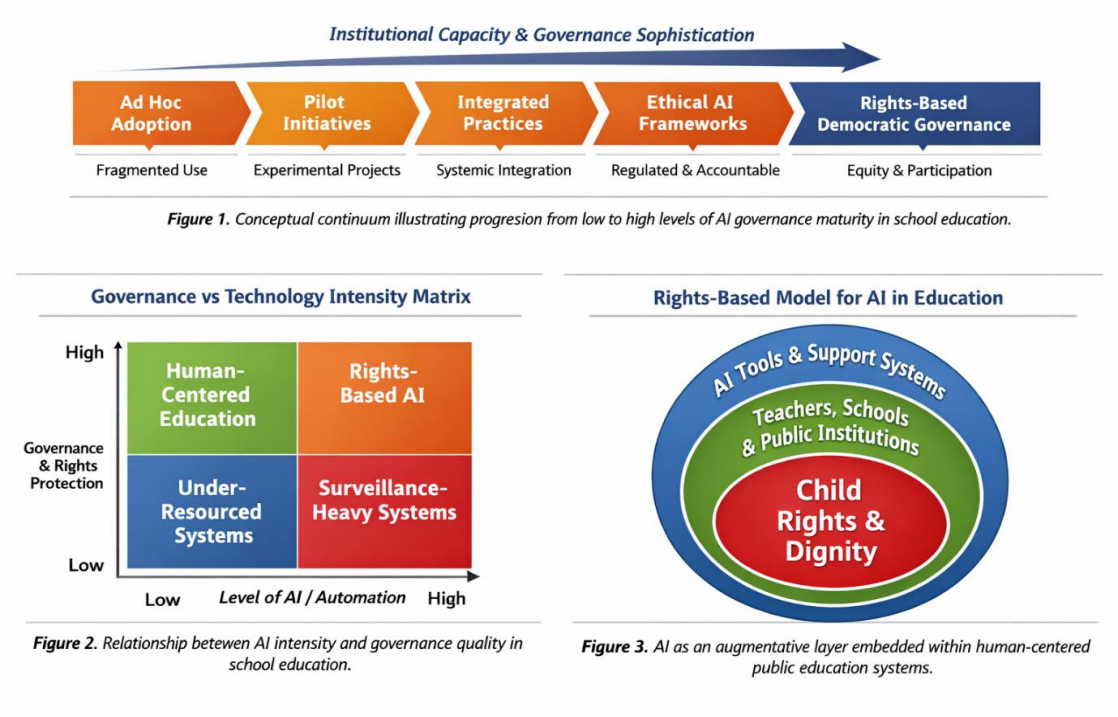


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Figure 3. *AI as an augmentative layer embedded within human-centered public education systems.*

Conclusion

This review demonstrates that governance maturity, rather than algorithmic sophistication, determines whether AI enhances or undermines educational goals. India's challenge is not technological capacity but institutional design. Embedding AI within strong public institutions, respecting teacher autonomy, and safeguarding child rights can ensure that AI serves as a supportive educational tool rather than a disruptive force.

Declaration on AI Use

This article was developed using a combination of human-authored analytical framing and AI-assisted drafting support, with full responsibility for interpretation, synthesis, and final content resting with the author. All language and arguments are original and intended for ethical, plagiarism-free academic publication.

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