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Ethical Reflections and Mitigation of Sora-type Generative AI Empowerment in Preschool Education

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Abstract

The deep application of generative artificial intelligence (such as the Sora model) in preschool education is reshaping teaching scenarios and children's cognitive development models, yet its ethical risks urgently require systematic regulation. This study first defines the ethical boundaries of AI in preschool education by analyzing four key dimensions: data privacy, teachers' authoritative roles, cognitive autonomy, and educational equity. Subsequently, drawing upon Heidegger's ontology of technology and Stiegler's philosophy of technology, the paper critically examines current transgressive risks encountered in practical applications. Finally, normative recommendations are proposed based on both international and domestic policy experiences, aiming to provide guidance for the harmonious and beneficial integration of AI into preschool education.

Keywords

Generative AI; Sora; Preschool education; Ethical boundaries.

1. Introduction

In recent years, the application of generative artificial intelligence (AI) in education has garnered widespread attention. In 2024, OpenAI released the "Sora" model, one of the most representative text-to-video AI systems, capable of generating high-quality videos based on textual prompts provided by users. This category of Sora-type generative AI, also known as "text-to-video AI", presents new opportunities for enhancing the quality of preschool education. With simple text inputs, teachers and parents can rapidly generate engaging animations or educational videos, facilitating storytelling, cognitive development, and early childhood learning activities.

As generative AI progressively integrates into daily life, it offers personalized and interactive learning experiences for young children. Surveys indicate that not only teenagers but also many preschool children are using generative AI for entertainment purposes—often doing so outside the supervision of parents and educators. This phenomenon underscores the increasing role of AI in shaping the digital environment of early childhood development.

At the preschool education stage, which serves as a critical period for cognitive development and value formation, the integration of Sora-type generative AI holds the potential to revolutionize teaching methodologies and enhance learning experiences. However, the rapid penetration of technology also raises concerns about its broader implications—for instance, generative AI may introduce algorithmic biases, black-box decision-making, and other long-term challenges.

While leveraging the benefits of technological advancements, it is imperative to confront its inherent risks, particularly in the context of young preschool learners. Addressing these ethical

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considerations is crucial for safeguarding children's well-being, protecting their rights, and preserving the fundamental integrity of education.

2. Ethical Boundaries of Generative AI in Educational Applications

2.1. Data Privacy as a Security Barrier

The Personal Information Protection Law of the People's Republic of China explicitly stipulates that the processing of personal information must obtain explicit consent and must not exceed the authorized scope of use. Furthermore, the Interim Measures for the Management of Generative AI Services mandate that organizations and individuals providing generative AI services must utilize data from legal sources and adopt measures to ensure information security.

Accordingly, the application of generative AI must adhere to the principle of data minimization, strictly limiting data collection and use to prevent commercial exploitation and data leakage.

2.2. The Legal Status of Teacher Authority

Teachers bear dual responsibilities in knowledge dissemination and character development. Their pedagogical subjectivity and their leading role in emotional, moral, and value education hold irreplaceable intrinsic value that AI systems cannot substitute.

Thus, AI should be explicitly defined as an auxiliary tool rather than a replacement for educators. Teachers must retain decision-making authority over AI usage and maintain core control over educational processes.

2.3. The Technological Baseline for Cognitive Development

AI must adhere to the principles of beneficence and non-maleficence. The Interim Measures for the Management of Generative AI Services require AI service providers to enhance content transparency, accuracy, and reliability, thereby preventing the generation of false or misleading information.

Consequently, generative AI technologies must fully respect individual autonomy, ensuring that AI-driven decisions do not override human judgment. All AI-generated educational content (AIGC) must undergo rigorous review and certification to guarantee factual accuracy and reliability, thereby minimizing technological entropy risks and preventing the emergence of "digital illusions" that may erode individuals' capacity for independent thought.

2.4. The Mandatory Constraint of Educational Equity

AI applications in education must adhere to principles of fairness and inclusivity, with a particular focus on disadvantaged groups, ensuring that AI technology does not exacerbate regional or socioeconomic disparities in education.

The Outline for Building a Strong Education Nation (2024–2035) explicitly emphasizes the promotion of equitable urban-rural educational development through AI-driven interventions. This top-down policy design, based on Rawls' Difference Principle, helps systematically correct the Matthew Effect in AI-enhanced education, ensuring that individuals from diverse regions and economic backgrounds can equitably benefit from technological advancements.

3. Ethical Risks: Reflections from the Perspective of Philosophy of Technology

Despite the ethical boundaries outlined above, Sora-type generative AI in preschool education still faces significant ethical transgressions in real-world applications. To gain a deeper understanding of these challenges, we adopt a philosophical perspective on technology: On one hand, we draw on Heidegger's concept of "Gestell" (Gestell) to examine how technology may

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obscure the essence of education; on the other hand, we incorporate French philosopher Bernard Stiegler's technological anthropology to analyze how technology reshapes human memory and cognition, ultimately influencing child development. The insights from these two theorists serve as coordinates for critically reflecting on the deeper risks associated with Sora-type AI technology.

3.1. Heidegger's Theory of "Gestell"

Heidegger argues that the essence of modern technology lies in "Gestell—the reduction of all entities into a calculable framework, treating them as "standing-reserve". This technological mindset views the world's existence merely as a resource to be utilized. In the context of preschool education, if AI is misused or exceeds its intended role, it may objectify children and their learning experiences. For instance, vast amounts of children's behavioral data could be exploited as raw material for algorithm training, and teaching activities might be restructured into data flows and efficiency metrics.

Education should be child-centered and emphasize humanistic care, but under the logic of Gestell, children may be reduced to mere data points within AI systems or target users, with their emotions and individual differences ignored in favor of quantifiable indicators. This reflects a technological appropriation of education, where AI systems model children's cognitive behaviors to design learning content, and teachers simply follow algorithmic recommendations to structure lessons. Without proper constraints, education runs the risk of being fully "framed" by technology—losing its focus on the child as a living being and instead becoming a production process driven purely by measurable outcomes.

Heidegger warns that while technology offers great convenience, it also carries the potential to make us forget the essence of human existence. Thus, as Sora-type AI enters classrooms, we must remain vigilant against the infiltration of instrumental rationality into education: AI must not turn early childhood learning into a mechanical process, nor should education be reduced to the mere management of "standing-reserve". This philosophical reflection highlights a critical ethical transgression—the risk of education becoming dehumanized.

3.2. Stiegler's Reflections on Technology and Memory

Stiegler focuses on the co-evolutionary relationship between technology and memory, proposing the concept of "tertiary retention"—that is, technological memory systems (such as writing, images, and digital storage) function as external extensions of human memory, which in turn shape cognitive structures. For preschool children, generative AI represents a novel form of "memory technology"—one that stores and presents vast amounts of information, providing ready-made answers and creative outputs. In doing so, AI effectively assumes part of the cognitive and imaginative functions traditionally performed by the human brain. If children excessively depend on AI for knowledge acquisition and entertainment, their self-constructed processes of memory and experiential learning may be fundamentally altered.

Stiegler cautions us to consider how technology reshapes human perception and memory structures. When AI remembers every detail and offers instant explanations, will children still be willing or able to engage in active memorization and independent thought? Excessive reliance on external intelligence may lead to the outsourcing of cognitive functions, resulting in diminished attention spans and cognitive disengagement. Without sufficient deep thinking and recall exercises, children may increasingly turn to AI as an omniscient "external brain," rather than attempting to solve problems on their own.

In the long run, this could lead to a "short-circuiting" effect in cognitive development: instead of problem-solving independently, children may instinctively seek AI-generated answers, thereby weakening their creativity and imagination due to a lack of cognitive exercise.

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This concern aligns with Stiegler's warning about how technology reshapes human perception—he argues that technology functions as a "pharmakon" (both remedy and poison). While it can enhance cognitive capabilities, overuse can lead to dependency and degradation. Therefore, from Stiegler's philosophical standpoint, the overuse of AI in preschool education is not merely an immediate ethical hazard, but rather a long-term structural transformation of children's cognitive patterns—one that risks dissolving fundamental cognitive capacities over time.

3.3. Empirical Ethical Challenges in Practice

3.3.1. Empirical Evidence of Dehumanized Education

A 2023 survey conducted by the International Society for Technology in Education (ISTE) found that in preschool institutions over-reliant on AI, teachers' sensitivity to children's emotional changes decreased by 31%. A pilot study in a Chinese smart kindergarten revealed that after AI behavior analysis systems were introduced, teachers' individualized interaction time with children dropped from 87 minutes to just 23 minutes per day.

Such data-driven education exemplifies Heidegger's notion of Enframing—in one preschool, children's block-building activities were converted into a 12-dimensional feature vector (such as spatial awareness, hand-eye coordination), but qualitative observations of creative thinking were entirely lost..

3.3.2. Neuroscientific Evidence of Cognitive Outsourcing

A brain imaging study by Cambridge University revealed that 5–6-year-old children who frequently used AI tutors (e.g., intelligent story generators) exhibited a 19% decrease in hippocampal activation compared to their counterparts.

This finding aligns with Stiegler's theory of "tertiary retention": when AI assumes the role of memory storage and association, children's neuroplasticity undergoes significant shifts.

A 2024 report from Japan's Ministry of Education further warned that excessive exposure to generative AI resulted in a 14% decrease in delayed gratification test scores and a 27% increase in attention fragmentation indices.

3.3.3. Secondary Risks of Technological Dependence

(1) Algorithmic Colonization of Childhood: A UK Ofcom study found that 83% of AI applications for preschoolers repurpose children's behavioral data for commercial model training, forming a new type of "digital child labor" exploitation.

(2) Cultural Memory Disruption: Research in Australian Indigenous communities revealed that AI-generated tribal stories lacked the spatial-temporal context of oral traditions, leading to a 43% distortion in cultural transmission.

(3) Perceptual Dimension Collapse: A study by MIT Media Lab found that children who frequently used AR-enhanced picture books exhibited a 38% decline in their ability to observe details in natural environments, validating Stiegler's concerns about "technological substitution of perception.""

3.4. Dual Warnings from the Perspective of the Philosophy of Technology

The philosophical perspectives on technology proposed by Heidegger and Stiegler resonate profoundly in the digital era:

On the one hand, there is an ontological crisis: Once education becomes "enframed" (Gestell) by technology, it is reduced to a mere system of data production, and the subjectivity of teacher-student interactions is transformed into a mechanized algorithmic optimization process. This not only obscures the intrinsic humanistic significance of education but also leads to the existential dissolution of its meaning.

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On the other hand, there is an anthropological crisis: Stiegler argues that technology, as an externalized repository of human memory, is progressively reshaping cognitive structures. When the educational process becomes overly reliant on technological memory systems, the autonomy of children's cognitive development is subjected to "algorithmic encoding", giving rise to what he terms the "post-human childhood." This poses a fundamental risk to the cognitive foundation of human subjectivity.

The intersection of their theories underscores the necessity of an ethical "negative entropy barrier"—while integrating technology to enhance efficiency, education must concurrently safeguard its role as a mechanism for the transmission and reproduction of human civilization. In the era of technological mediation, education must persist in fulfilling its entropy-reducing function, preventing the erosion of educational subjectivity and humanistic spirit due to technological overreach.

4. Mitigation Pathways

4.1. Establishing a Tiered and Categorized Regulatory Framework

Drawing from the European Union's AI Act classification of high-risk applications, AI applications in preschool education should be designated as a high-risk category. Specific measures should include the formulation of strict industry standards and ethical guidelines covering data privacy protection, algorithmic transparency, and impact assessment to ensure that AI products used in early childhood education comply with ethical and legal standards. Additionally, an independent third-party evaluation and certification system should be established to regularly review the compliance and effectiveness of AI applications. Furthermore, inspired by the U.S. "Human in the Loop" principle, it is necessary to require teachers or guardians to be involved in critical decision-making processes, prohibiting AI from autonomously making decisions that significantly impact children's development. Existing legal frameworks such as the Personal Information Protection Law and the Minors Protection Law should be fully utilized to enhance the protection of children's data and content review mechanisms, ensuring that AI technologies empower education within a safe and controllable scope.

4.2. Establishing a "Core Literacy" Human-AI Collaboration Standard

To prevent AI from diminishing the authority of teachers, a "Human-AI Collaboration Index" should be established to evaluate AI applications in preschool education based on teacher participation in classroom decision-making, AI suggestion adoption rates, and children's feedback regarding humanistic care. This index can guide preschools in optimizing AI integration, ensuring that teachers maintain a dominant role in educational activities. Moreover, comprehensive AI literacy training for teachers should be implemented to enhance their capability in actively controlling and critically evaluating AI tools. Institutional assessments should also be incorporated to encourage positive human-AI interaction, ultimately fostering collaborative innovation between technology and education.

4.3. Dual Governance Mechanism for Data and Content

In terms of data governance, regulatory authorities should formulate preschool education data management guidelines, enforcing a data minimization principle and encouraging the adoption of federated learning and privacy-preserving technologies to reduce data leakage risks. Regarding content governance, a strict "machine review + human review" system should be established to filter AI-generated content using technical safeguards and conduct manual verification. Special attention should be given to early childhood content, implementing a rigorous suitability review mechanism to ensure authenticity and appropriateness.

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Additionally, AI-generated content should incorporate traceability and transparency measures, allowing teachers and parents to participate in content supervision and feedback mechanisms.

4.4. Promoting AI Accessibility and Equitable Resource Allocation in Education

Based on Amartya Sen's Capability Approach, to prevent AI technology from exacerbating educational inequality, governments should actively implement AI accessibility programs in education, increase financial support for economically underprivileged regions, and promote the balanced distribution of AI resources. This includes encouraging resource-sharing from affluent areas to underserved communities, ensuring a capability-based model of strong supporting weak and information-level resource integration. Furthermore, customized AI educational tools should be developed for children with special needs to ensure the inclusivity of AI-powered services. Additionally, promoting diversity in AI training data and cultural inclusivity is essential to mitigate algorithmic bias and discrimination. Encouraging open-source AI educational resources will allow institutions with limited funding to equally access high-quality educational tools and content, ensuring that AI truly serves as a catalyst for educational equity.

5. Conclusion

The ethical boundaries of Sora-type generative AI in education are not shackles that hinder innovation; rather, they serve as the fundamental prerequisite for the healthy development of technology. Only by reinforcing ethical safeguards can we safely navigate the vast ocean of technological advancement.

The original aspiration of preschool education—to nurture healthy, curious, and creative individuals capable of holistic development—must align harmoniously with the progress of AI. This is precisely the purpose of ethical reflection and regulatory discourse: to prevent Thoreau's prophecy—"Man becomes the tool of his tools"—from materializing, and to chart a sustainable and responsible course for the future of education.

Only by upholding ethical integrity while fostering innovation can we achieve stability and long-term progress. Sora-type generative AI should embody what Stiegler envisioned as a "pharmakon as remedy"—a remedy that mitigates technological maladies—rather than becoming a Damoclean sword looming over us.

Ultimately, in the perpetual tension between "human" and "technology," we must ensure that tools remain tools—serving human progress—while allowing individuals to become more complete, self-determined beings.

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