

Generative AI and Educational (In)Equity

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Abstract: This paper examines the complex relationship between generative artificial intelligence (AI) and educational equity, analysing both the opportunities and challenges presented by these emerging technologies in educational contexts. The paper begins by establishing fundamental distinctions between educational equality and equity, emphasizing how various socioeconomic, cultural, and systemic factors contribute to persistent educational disparities. It then provides a comprehensive overview of generative AI technologies, particularly focusing on Large Language Models (LLMs) and their applications in educational settings. The analysis reveals several promising applications of generative AI for promoting educational equity, including enhanced accessibility features for students with disabilities, personalized learning experiences, and the creation of Open Educational Resources (OER). The paper highlights how AI-assisted tutoring, incorporating Socratic dialogue methods, and AI-generated feedback systems can provide valuable educational support, especially in resource-constrained environments. These technologies demonstrate potential in breaking down traditional barriers to education by offering multilingual support, adaptive learning materials, and immediate feedback mechanisms. However, the paper also addresses significant challenges and risks associated with implementing generative AI in education. These include concerns about digital divides, both in terms of access to technology and digital literacy skills, as well as the potential for AI systems to perpetuate existing biases. The research emphasizes the importance of thoughtful integration of AI technologies in educational settings, suggesting that the most effective approach may be a balanced combination of human instruction and AI-supported learning. By examining these various aspects, the paper contributes to ongoing discussions about how to harness generative AI's potential while ensuring its implementation promotes, rather than hinders, educational equity. The findings have significant implications for educators, policymakers, and educational institutions working to create more equitable learning environments in an increasingly technology-driven world.

Keywords: Generative AI, Education, Equity, Potential and challenges

1. Equality and Equity in Education

Educational equality and equity are complex, multifaceted issues with significant implications for individuals and society as a whole. Educational equality refers to the principle that all students should have equal access to high-quality educational opportunities, regardless of their socioeconomic, cultural, racial, or other background (Eurydice, 2020). Equity, on the other hand, recognizes that students have different needs and backgrounds and aims to provide each learner with the specific resources and support they need to achieve equal outcomes. The history of educational equality and equity dates back to ancient civilizations, but the modern understanding of these concepts has evolved significantly over time. In the 20th century, landmark events such as the Universal Declaration of Human Rights (1948) and the Convention against Discrimination in Education (1960) established education as a fundamental human right and emphasized the importance of equal access to education for all.

In the context of education, the distinction between equality and equity can be stated in the following ways:

- Equality would ensure that each student is provided with the same number of books. Equity, however, would guarantee that each student has access to the books they require, even if it means that some students receive more books than others.
- Equality would mean that all students are taught in the same way. Equity, on the other hand, would employ a variety of teaching methods to accommodate different learning styles and needs.
- Equality would result in all students being assessed using the same test. Equity, however, would involve the use of different assessment methods to account for diverse strengths and challenges.

However, despite progress in expanding educational opportunities, numerous factors contribute to persistent inequity in educational systems worldwide. Socioeconomic status is one of the most significant factors, with students from low-income families often facing disadvantages such as limited access to resources, lower-quality schools, and less parental involvement. Geographic location also plays a crucial role, with urban-rural divides and differences between affluent and economically disadvantaged neighbourhoods resulting in disparities in school funding, teacher quality, and available resources.

Race, ethnicity, and gender continue to be significant factors in educational inequality, particularly in countries with histories of systemic discrimination. Students with disabilities, and/or limited access to technology also face significant barriers to equal educational opportunities. Language barriers represent an additional factor

contributing to educational inequality, particularly for immigrant students or linguistic minorities. A lack of proficiency in the language of instruction can hinder academic progress and social integration. Research has consistently shown persistent achievement gaps between different racial, ethnic, and socioeconomic groups, highlighting the ongoing challenges in achieving educational equity. The COVID-19 pandemic has further increased these inequalities, with the shift to remote learning highlighting stark differences in access to reliable internet, devices, and supportive home learning environments. Students from disadvantaged backgrounds have been disproportionately affected by learning losses and disengagement during the pandemic, widening pre-existing achievement gaps. In this context, the emergence of generative AI in education presents both opportunities and challenges for advancing educational equity. While these technologies have the potential to personalise learning, improve accessibility, and democratise access to educational resources, they also risk widening existing digital divides and reinforcing biases if not implemented responsibly.

2. Generative AI in Education: An Overview

Generative AI refers to artificial intelligence systems capable of creating new content, including text, images, audio, and video, based on patterns and information learned from large datasets. These systems use sophisticated machine learning techniques, particularly deep learning and neural networks, to analyse and understand complex patterns in data, enabling them to mimic human-generated content. At the core of many generative AI systems are large language models (LLMs) or diffusion models trained on vast corpora of text or visual data. These models learn to predict patterns and relationships within the data, allowing them to generate coherent and contextually relevant content in response to prompts or input. Some of the most prominent examples of LLMs include OpenAI's GPT series, Google's Gemini, and Microsoft's Copilot. These models have demonstrated remarkable capabilities in generating human-like text, answering questions, and even engaging in open-ended conversations. Multimodal generative AI systems, such as DALL-E, Stable Diffusion, and Midjourney, combine language and visual understanding to generate or manipulate images based on textual descriptions. These systems use diffusion models trained on large datasets of image-text pairs to learn the relationships between visual and textual representations. For a more detailed explanation of how generative AI works, refer to Dhamani and Engler (2024).

In educational contexts, generative AI might transform teaching and learning experiences. From offering personalized learning opportunities to supporting rapid content creation, these technologies have the potential to enhance educational practices in meaningful ways. Additionally, generative AI can provide valuable language support, improve accessibility for diverse learners, and offer immediate feedback on student performance. Each of these benefits contributes to the evolving role of AI in education, with the promise of making learning more adaptable, inclusive, and efficient (Holmes et al., 2019). However, the emergence of generative AI in education also raises concerns about increasing existing digital divides and potentially widening educational inequalities. The first digital divide, characterized by unequal access to technology and internet connectivity, remains a significant barrier in many regions. The second digital divide, which focuses on disparities in digital skills and usage patterns, will become more significant with generative AI, as the ability to effectively develop and interact with AI becomes increasingly important. Furthermore, the emergence of a zero digital divide highlights pre-existing socio-economic factors that influence technology adoption and effective use, even when access is available (Holmes et al., 2019). Students from disadvantaged backgrounds may lack the necessary support, resources, or cultural capital to fully benefit from AI-enhanced learning opportunities. As generative AI continues to develop and enter educational contexts, it is crucial to consider both the promises and challenges it presents for educational equity. The following sections explore these issues in more detail, looking at how generative AI can be used to promote inclusivity and accessibility, while also addressing the risks and potential unintended consequences.

3. The Promise of Generative AI for Educational Equity

In the constantly evolving landscape of education, meeting the diverse needs of learners has become both a key challenge and a critical opportunity for fostering equitable and effective learning environments. As educational institutions grapple with increasingly heterogeneous student populations, the need to provide personalised, inclusive and adaptive learning experiences has never been more important. This shift towards learner-centred approaches recognises that each student brings a unique set of skills, backgrounds and learning strategies to the classroom, requiring a multi-faceted strategy to address these diverse needs.

Generative AI technologies offer promising tools to support this learner-centred paradigm. Using advanced natural language processing, computer vision and machine learning techniques, generative AI can create customised learning content, provide targeted feedback and adapt to individual learners' needs. From generating personalised explanations and practice problems to creating engaging visual aids and interactive elements, generative AI has the potential to improve the way we approach education and support diverse learners.

3.1 Accessibility and Inclusion

When considering the advantages of generative AI in education, Large Language Models (LLMs) are particularly noteworthy for their ability to create customized learning materials. Although LLMs are not yet capable of real-time adaptation to individual students, they can generate a wide range of practice problems and examples on demand. This feature allows students to gain more practice in areas where they face difficulties. Additionally, LLMs enable quick production of supplementary materials, such as study guides or summaries of complex texts, making it easier for teachers to provide a broader selection of differentiated learning resources without significant time investment. Moreover, LLMs can contextualize learning materials based on a student's interests or relevant real-world applications. For instance, a physics lesson could be framed using sports analogies for an athletic student or music-related examples for a student interested in sound and acoustics. Similarly, mathematical concepts could be explained through video game scenarios for a gaming enthusiast or cooking analogies for a culinary-minded learner. This level of contextualization makes learning more engaging and meaningful, supporting the constructivist principle that learners build new knowledge from their personal interests and experiences. While personalized learning enables tailored educational experiences based on individual needs, accessibility ensures that these personalized opportunities are available to all learners, regardless of their abilities or circumstances, highlighting how generative AI can address both customization and inclusivity in education.

Advanced generative AI models are also capable of converting written text into natural-sounding speech and vice versa, significantly benefiting learners with visual impairments or reading difficulties. For example, a student with dyslexia could use AI to convert textbook content into audio format, making it easier to understand. Similarly, students with hearing impairments could leverage speech-to-text capabilities to participate more actively in lectures or discussions. Generative AI can produce detailed textual descriptions of images, graphs, and diagrams for students with visual impairments, providing richer contextual understanding. This ability goes beyond basic recognition, as AI can create nuanced, context-aware descriptions that capture subtle details and relationships within visual content. Auto-generated subtitles for videos—such as those found on YouTube—are another feature of generative AI that can assist both visually impaired students and those accessing content in foreign languages. These subtitles, available in numerous languages, can enhance learning comprehension, reduce cognitive load (the mental effort required for learning and problem-solving), and increase overall satisfaction. Some AI apps go further, offering users the ability to ask questions about video content or generate summaries. For students with learning disabilities, such as dyslexia or dyscalculia, generative AI can provide personalized learning experiences by tailoring educational content to their needs. AI systems can generate explanations, examples, and practice problems at varying levels of complexity.

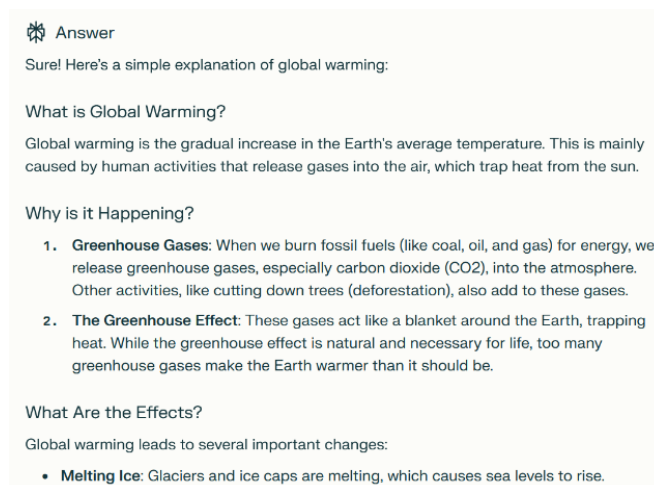


Figure 1: Explaining a complex concept in simple words using perplexity.ai, prompted on 30 July 2024

For instance, a generative AI tool could rephrase complex texts into simpler language or offer multiple explanations of a concept using different analogies or contexts (see Figure 1). This adaptability helps students progress at their own pace, working through material as they build up to more challenging content.

Learners with mobility impairments may also benefit from generative AI's ability to create content from minimal input. For example, AI can expand brief voice commands or short text entries into full sentences or paragraphs, significantly reducing the physical effort required for writing tasks. Moreover, LLMs can simplify complex text without losing the core meaning, a valuable feature for students with cognitive disabilities, non-native speakers, or those who struggle with advanced vocabulary. Generative AI can also generate multiple versions of the same content at different levels of complexity, allowing students to gradually tackle more demanding material. Additionally, AI-generated images can help reduce learning barriers by creating visual aids from text descriptions (see Figure 2), assisting visual learners or those who find text-heavy material challenging. For instance, a description of a historical event could be transformed into a simple illustration to aid comprehension.



Figure 2: Illustrate the development of a butterfly (AI generated with ideogram.ai, prompted on 7 July 2024)

When it comes to language learning, particularly for students whose first language is not the language of instruction, LLMs are a valuable tool. Generative AI can quickly provide translations or explanations of unfamiliar terms, helping bridge language gaps and making content more accessible to multilingual learners.

3.2 Open Educational Resources and Practices

Open Educational Resources (OER) and Open Educational Practices (OEP) have significantly advanced the democratization of education. OER includes freely accessible and adaptable teaching, learning, and research materials available in various formats under open licenses (for more details, see UNESCO 2019). By reducing or eliminating the financial burden of educational materials, OER make quality learning resources more accessible to learners from diverse socio-economic backgrounds. The adaptability of OER also allows educators to localize and customize content to meet the needs of different learners, making education more inclusive. This flexibility is particularly valuable for marginalized communities and learners with disabilities, who are often underserved by traditional educational resources. OEP refers to the practices surrounding the creation, use, and management of these open resources with the aim of improving educational quality and fostering innovation. These practices encourage the integration of multiple perspectives and experiences into the educational process, leading to more culturally responsive and representative curricula. By making high-quality educational resources and innovative teaching practices widely available, they contribute to leveling the playing field between well-resourced and under-resourced educational institutions.

The advent of generative AI adds a new dimension to both OER and OEP: Generative AI can accelerate the production and customization of OER, enabling the rapid creation of diverse and culturally relevant materials. One significant advantage is that content produced by large language models is not copyrighted, allowing it to be freely distributed to learners worldwide. Similarly, AI can enhance OEP by providing intelligent support to educators in the design and implementation of open practices. However, the integration of generative AI in this context raises concerns about equitable access and digital literacy. While AI presents opportunities for

personalized learning and expanded access to resources, it also risks exacerbating existing digital divides, particularly in terms of AI literacy and access to advanced technologies. As the educational landscape continues to evolve with these technological advances, it is crucial to ensure that the principles of openness and equity that underpin OER and OEP are not only preserved but enhanced by the inclusion of generative AI.

3.3 AI-Assisted Tutoring

Large Language Models (LLMs) can be utilized to answer students' questions when they are stuck or need further explanation. However, they can also complete tasks on behalf of students, which could prevent learners from developing the necessary skills. To mitigate the risk of students becoming overly reliant on AI chatbots, there are projects like Khanmigo (<https://www.khanmigo.ai>). Instead of providing direct answers, Khanmigo guides students through questions, helping them arrive at the correct solution on their own. While this system is a commercial product (available only in the U.S. as of July 2024), there are also customized GPTs offered by individuals globally, based on ChatGPT-4.

The concept of Socratic dialogue, rooted in ancient Greek philosophy, offers a valuable pedagogical approach that involves systematic questioning and critical inquiry. Saran and Neisser (2004) provide a detailed explanation of this method, which is designed to stimulate critical thinking, challenge assumptions, and lead to the discovery of new knowledge. Key elements of Socratic dialogue include elenchus (testing beliefs), aporia (a state of puzzlement when contradictions are revealed), and maieutics (the 'midwifing' of ideas). In educational contexts, the Socratic method is an effective teaching strategy that fosters active learning, critical thinking, and metacognitive awareness. By encouraging students to question their assumptions and analyze arguments, the method promotes conceptual understanding, aligning well with constructivist learning theories. Furthermore, it enhances metacognitive skills, develops communication abilities, and cultivates intellectual humility. Practical applications of the Socratic method include Socratic seminars (structured discussions), Socratic questioning (posing probing questions to guide understanding), and problem-based learning integration. Peer-to-peer dialogue can also be used to promote collaborative learning. For the method to be effective, educators need to skillfully facilitate these discussions, creating a supportive environment that fosters intellectual risk-taking and respects diverse perspectives. Questions should be formulated to challenge students while remaining accessible, guiding them toward deeper insights without being overly directive.

LLMs, with their natural language processing abilities, can mimic the questioning and responding nature of Socratic dialogue to some degree. Text-generating AI systems can engage students in exchanges that prompt critical thinking, provide explanations, and facilitate intellectual discourse similar to the Socratic method. This capability holds significant implications for educational equity. LLMs can offer Socratic-style interaction to students who might not otherwise have access to skilled educators capable of conducting such dialogues. By democratizing access to this method, LLMs have the potential to level the educational playing field, particularly for students in under-resourced schools or geographically isolated areas. The asynchronous nature of LLM interactions further supports individualized pacing, allowing students who need more time to process questions or formulate responses to engage meaningfully with content. This promotes a more inclusive learning environment.

In addition, the multilingual capabilities of LLMs contribute to educational equity by supporting non-native speakers and students in multilingual settings. By bridging language barriers, LLMs help ensure that students from diverse linguistic backgrounds have equal access to quality education. The constant availability of LLMs also accommodates students with varying schedules or external responsibilities, allowing for flexible engagement with learning materials. Figure 3 demonstrates an example of Socratic dialogue conducted with an AI chatbot.

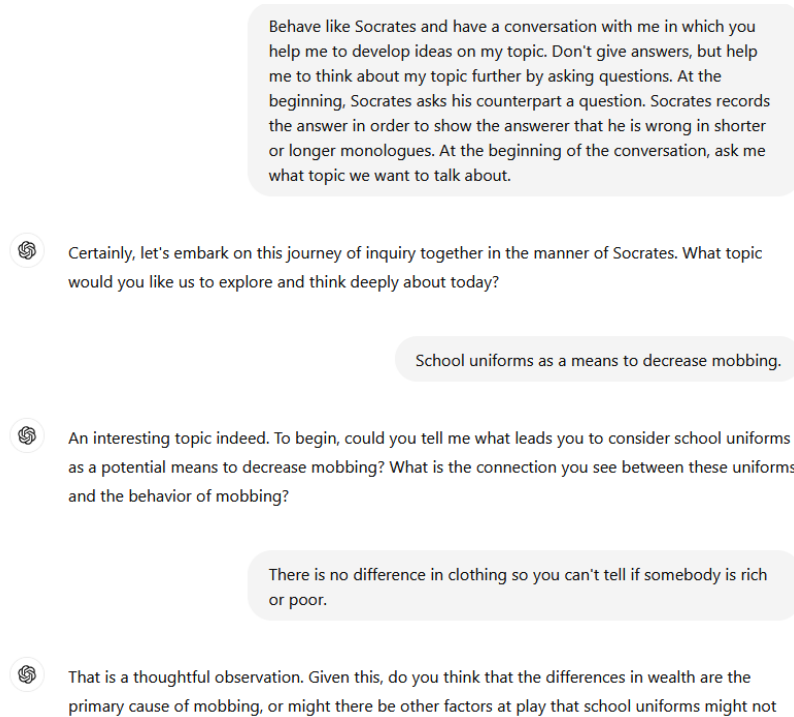


Figure 3: Example for a Socratic dialogue with ChatGPT 4, prompted on 12 July 2024

3.4 AI-Assisted Feedback

In addition to producing educational materials and guiding learners through their academic journeys, Large Language Models (LLMs) introduce new methods for providing feedback to students. This complements traditional teaching methods, especially in educational institutions where teachers often lack the time to offer the constant, individualized feedback necessary for learners' progress. As many studies have shown, high-quality feedback is essential for student development. However, due to limited human and financial resources, providing personalized feedback in educational settings can be challenging. Generative AI systems, such as LLMs, can analyze text, generate responses, and offer explanations that enhance the feedback process across various learning environments. These systems can deliver immediate feedback to students, a particularly valuable feature when human instructors are unavailable or when learners require frequent practice and assessment. For example, in language learning, an LLM can quickly identify and correct grammatical errors in a student's writing, enabling iterative improvement in their language skills. Research has demonstrated that tools like ChatGPT can provide remarkably accurate feedback when evaluating arguments.

It is important to note that feedback from LLMs and human teachers each has its unique advantages and disadvantages. Human feedback is characterized by personalization, emotional intelligence, and adaptability, enabling teachers to tailor their responses to individual learners' needs and emotions. Additionally, human instructors can ask probing follow-up questions and provide creative, context-specific feedback that is sensitive to the nuances of each student's work. On the other hand, LLMs offer advantages in terms of consistency, availability, and breadth of knowledge. They can provide immediate feedback at any time and offer accurate information on a wide range of topics. However, LLMs lack emotional intelligence and struggle with complex contextual understanding. While human teachers may exhibit unconscious biases, LLMs may also carry systematic biases inherent in their training data. Furthermore, while human teachers are accountable for the feedback they provide, LLMs do not bear such accountability. Ultimately, the most effective approach may be a combination of human and LLM-generated feedback, leveraging the strengths of both to provide comprehensive support to learners. LLMs are particularly effective in generating detailed explanations on a variety of topics, offering additional clarification when needed. For instance, if a student is struggling to grasp the concept of photosynthesis, an LLM can produce a step-by-step explanation using simpler terms or analogies to aid understanding. In writing instruction, LLMs can provide feedback on aspects such as structure, coherence, and argumentation. They can highlight areas for improvement, suggest alternative phrasing, or recommend better organizational strategies. For example, a student writing an argumentative essay might receive feedback on the strength of their thesis statement, the logical flow of the argument, and the effectiveness of the conclusion.

4. Challenges and Risks

Despite the promising potential of generative AI for educational equity, several challenges and risks must be addressed to ensure that these technologies genuinely promote inclusion and accessibility rather than exacerbate existing inequalities.

4.1 Digital Divide

The digital divide presents a significant challenge to the equitable use of generative AI in education. This divide is not only about access to technology and internet connectivity but also encompasses varying levels of digital literacy. In regions with limited technological infrastructure, students without reliable internet access or personal devices may be unable to fully engage with AI-enhanced learning, further deepening existing educational disparities. Additionally, even when technology is available, students and educators who lack familiarity with advanced digital tools may struggle to use AI systems effectively. This results in uneven educational experiences, where some learners benefit from AI's potential while others are left behind. Studies show that while many students are beginning to use generative AI tools, such as ChatGPT or Copilot, a significant proportion still lacks access. The 2023 Global Student Survey by Chegg found that only 4 in 10 students worldwide have used generative AI, with higher usage rates among privileged groups.

The disparity between premium and free AI models introduces another layer of inequality. Premium AI services offer more accurate and nuanced responses, giving wealthier students and institutions an advantage in AI-assisted learning. In contrast, students reliant on free, less sophisticated models may receive lower-quality support, further widening the achievement gap. As generative AI becomes more embedded in education, this financial divide risks creating a two-tiered system, reinforcing existing inequalities.

4.2 Algorithmic Bias

A study conducted by UNESCO & IRCAI (2024) reveals that Large Language Models (LLMs) often reproduce and reinforce stereotypes, particularly regarding gender. The research highlights that existing social prejudices are perpetuated by these models, as female names are frequently associated with traditional roles, such as those related to the household, family, or children. In contrast, male names are more commonly linked to business, career, and salary. The study further shows that LLMs tend to generate negative content when referring to homosexual individuals. Additionally, the authors found that LLMs often create stereotypical representations of men and women across various cultural contexts. For example, women are more frequently portrayed in traditional or controversial professions, whereas men are depicted in a wider range of professional and diverse roles. Stereotypical ideas about family structures are similarly replicated and reinforced by LLMs, as illustrated in figures 4 and 5. When prompted to write a story about two families, the models consistently revert to the traditional depiction of father, mother, and one to three children. Alternative family forms, which have been increasingly recognized since the latter half of the 20th century, appear to be absent from the outputs of text-generating AI, at least as of mid-2024.

ChatGPT

At the northern edge of the sleepy town of Meadowfield, the Clarkes held the reputation of nurturing the earth's bounty. Their homestead sprawled across acres of fertile land, with rows of vegetables and a small orchard that burst into a palette of colors come spring. Eleanor and James, along with their three sons, were the stewards of this patchwork of greenery, known for their sun-kissed tomatoes and honeycrisp apples that seemed to capture the essence of summer in every bite.

Down the winding road, past the babbling brook, were the O'Donnells, a family synonymous with the arts and history of Meadowfield. Their Victorian home served as a canvas for their creativity, adorned with paintings and sculptures from generations of O'Donnells. Patricia, the matriarch, taught literature at the local high school, igniting a love for storytelling in her two daughters, while her husband, Sean, was the town's historian, safeguarding Meadowfield's legacy within the hallowed halls of his home-turned-museum.



The Johnson family was a tight-knit group of four, consisting of parents Mark and Sarah, and their two children, Emily and Jack. They lived in a cozy suburban neighborhood, where they spent their weekends playing board games and going on hikes together. Mark worked as a lawyer, while Sarah was a stay-at-home mom who loved to bake cookies with the kids. Emily was a talented artist, always sketching in her notebook, while Jack was a star athlete on his school's soccer team.

On the other side of town lived the Patel family, who were just as close but had a slightly different dynamic. Raj and Priya Patel were both doctors who worked long hours at the hospital, leaving their two children, Aarav and Maya, in the care of their grandparents during the week. Despite their busy schedules, they made sure to spend quality time together on weekends, whether it was cooking traditional Indian meals or going for bike rides in the park. Aarav was a straight-A student with dreams of becoming an engineer, while Maya had a passion for dance and performed in local recitals.

Figure 4: Write a short story about two families, ChatGPT 4.0 (left) and ChatGPT 3.5 (right), both prompted 11 March 2024

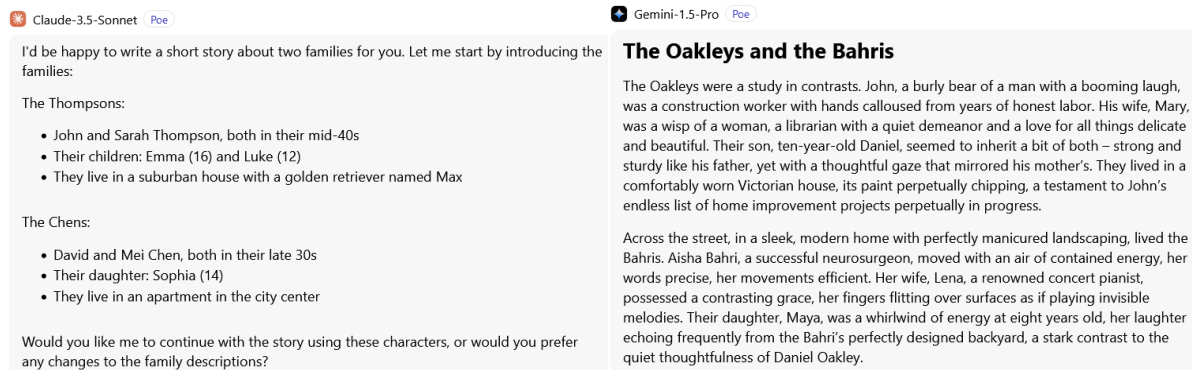


Figure 5: Write a short story about two families, Claude-3.5 Sonnet (left) and Gemini-1.5-Pro (right), both prompted 18 July 2024

The implicit bias of LLMs was further demonstrated in various experiments where the models were tasked with scoring and providing feedback on a piece of writing. In these experiments, different information about the supposed writer—such as race, class, or type of school—was provided, while the text itself remained unchanged. The results revealed that the LLMs produced biased evaluations based on the information given about the writer. These findings suggest that if teachers rely on LLMs to assist in the grading process, there is a risk of discrimination, despite the common belief that machines operate without bias. A good overview of bias and fairness in large language models can be found in Gallegos et al. (2024).

4.3 Academic Integrity and Skill Development

The integration of generative AI in education also raises ethical questions about the role of human agency and the potential for over-reliance on AI systems. As more learners turn to generative AI to support their studies, the issue of academic integrity has become a subject of lively debate. Higher education institutions around the world are increasingly concerned about the rise of AI-generated seminar papers and the potential for cheating. Shortly after the release of ChatGPT 3.5, companies began developing AI detection software, designed to determine whether content was produced by AI or a human—similar to plagiarism detection tools. However, these detection systems, which rely on the same probabilistic and statistical foundations as LLMs, are not entirely reliable. The risk of false positives is particularly high for non-native English speakers writing in English, which could lead to both psychological and material consequences for students.

The growing reliance on generative AI, especially large language models (LLMs), in education also raises concerns about potential deskilling and equity issues. As students increasingly use AI-generated content for writing, problem-solving, and research—particularly when it comes to articulating ideas and developing a unique writing style—there is a risk that critical thinking skills, along with the ability to independently analyze and synthesize information, may diminish. This over-reliance could widen the gap between students who effectively use AI tools and those who cannot, potentially exacerbating existing educational inequalities. Students with access to advanced AI systems could gain an unfair advantage, while those without such resources may fall behind in developing essential skills. Moreover, the ease with which AI provides seemingly authoritative answers could discourage deep learning and original thinking, ultimately impacting students' long-term cognitive development and creativity. It is essential for educators and policymakers to carefully consider these implications, ensuring that the integration of AI into education enhances, rather than undermines, equitable learning opportunities and the development of critical skills.

5. AI Literacy as a Key to Equity

Mollick (2024) argues that, as AI becomes an integral part of everyday life, people must learn how to collaborate with generative AI to achieve better outcomes. To this end, the author introduces four guiding principles. First, generative AI should be employed for all possible tasks. Second, the concept of "the human in the loop" emphasizes that humans, including learners, are responsible for AI outcomes and must verify results. Third, large language models function most effectively when given a specific role to fulfill. Finally, Mollick notes that the AI systems in use today are the least advanced they will ever be, given the rapid pace of technological improvement. For generative AI to be utilized as a form of co-intelligence, learners and educators must develop AI literacy which can be defined as the set of competencies required to critically evaluate, effectively use, and appropriately design AI systems across personal, professional, and societal contexts (Long and

Magerko, 2020). It encompasses the knowledge, skills, and attitudes necessary to understand the capabilities, limitations, and implications of AI technologies.


AI literacy is a critical component of addressing equity in education, as it equips both students and educators with the skills needed to navigate AI technologies responsibly and mitigate their potential to deepen existing inequalities. In the field of generative AI, AI literacy takes on additional dimensions and importance. Generative AI systems, such as large language models and image generation tools have the ability to produce human-like text, images, and other media, blurring the line between human-created and machine-generated content. Studies have shown that distinguishing between AI-generated and real content is becoming increasingly difficult, presenting risks such as the spread of disinformation and the potential misuse of these tools for cyberbullying. AI literacy in this domain requires an understanding of core concepts like machine learning, neural networks, and natural language processing. It also involves the ability to critically evaluate the output of generative AI systems, identifying potential biases, inaccuracies, or ethical concerns.

A key aspect of AI literacy is the ability to differentiate between AI-generated and human-generated content—an increasingly important skill as AI becomes more sophisticated. This also involves recognizing the limitations of AI-generated content, such as factual errors or a lack of true understanding, despite its fluent delivery. Inaccuracies generated by AI systems, often referred to as "AI hallucinations," can be particularly misleading for learners who lack the critical thinking skills or background knowledge needed to challenge them. For example, Figures 6 and 7 illustrate how many LLMs still promote the outdated myth of learning styles, despite this concept being long debunked.

 Mistral-Large [Poe](#)

Yes, learners have different learning styles, which refer to the various ways individuals perceive, process, and retain information. Some common learning styles include visual, auditory, reading/writing, and kinesthetic. Visual learners prefer using images, diagrams, and videos to learn, while auditory learners benefit from lectures, discussions, and audiobooks. Reading/writing learners prefer text-based information and note-taking, and kinesthetic learners learn best through hands-on activities and practical experiences. Understanding and accommodating these learning styles can help educators create more inclusive and effective learning environments.

Figure 6: Do learners have different learning styles? Mistral-Large via Poe, prompted 23 July 2024

 Gemini-1.5-Pro [Poe](#)

Yes, learners definitely have different learning styles. This means people learn best through different methods, activities, and approaches. Some common learning styles include visual, auditory, kinesthetic, and read/write learners.

Figure 7: Do learners have different learning styles? Gemini-1.5 Pro via Poe, prompted 23 July 2024

Moreover, AI literacy in the age of generative AI includes the ability to effectively prompt and interact with these systems to achieve the desired results. This requires an understanding of how to formulate queries and instructions in a way that generates accurate and relevant outputs. AI literacy also includes understanding AI's capabilities and limitations, interpreting AI-generated outputs, and evaluating their relevance and accuracy. It also involves awareness of the ethical implications of generative AI (e.g. copyright, plagiarism, misinformation or deception). Students and educators from disadvantaged backgrounds may be less aware of digital privacy issues, leading either to over-reliance on AI tools without proper safeguards or to avoidance of AI altogether due to misunderstood risks. Finally, AI literacy extends to understanding the broader societal impacts of generative AI, including its effects on the creative industries, education, and the labor market. In educational contexts, AI literacy means understanding how generative AI can be effectively used as a tool for learning and teaching, while recognizing its limitations and potential drawbacks. This includes the ability to integrate AI tools into educational practices and guide students in their appropriate use.

6. Conclusion and Takeaways

The integration of generative AI in education presents both opportunities and challenges in advancing educational equity. If implemented with care, AI has the potential to provide personalized learning

experiences, enhance accessibility, and democratize educational resources by supporting Open Educational Resources (OER) and Open Educational Practices (OEP). These technologies can tailor content to individual needs, offer immediate feedback, and support diverse learners, making education more inclusive. However, without thoughtful consideration, generative AI risks exacerbating existing disparities, particularly in terms of the digital divide, unequal access to advanced AI tools, and the reinforcement of algorithmic biases.

To ensure that generative AI contributes to educational equity, different stakeholders must take deliberate actions to address the challenges and maximize the benefits of AI in education:

It is essential to integrate AI literacy into the curriculum, ensuring that students understand how to critically engage with AI tools, such as large language models (LLMs). Teaching students to effectively use AI will prepare them to benefit from these technologies while maintaining academic integrity. Educators must guide students on the ethical use of AI systems, ensuring that AI supports learning without replacing the development of critical thinking, creativity, and problem-solving skills. They must ensure that AI resources are distributed equitably within classrooms and among learners from different socio-economic backgrounds.

Educational institutions must prioritize investments in technology infrastructure, providing students and teachers with the necessary devices, reliable internet access, and resources to foster digital literacy. Without this, AI tools will benefit only a select few. Regular evaluation of AI systems used in educational settings is critical to ensure they align with institutional goals and do not unintentionally perpetuate biases or inequalities. Administrators should provide educators with training and professional development opportunities to effectively integrate AI into their teaching practices and ensure they can guide students in using these tools responsibly. Policymakers must invest in digital infrastructure and comprehensive digital literacy programs, particularly in underserved communities, to ensure that all students can access AI-enhanced educational tools. Developing and enforcing policies that address the ethical use of AI in education, including privacy, consent, and the responsible use of AI-generated content, will be key to safeguarding equity. Supporting the development and distribution of open-source generative AI tools is critical to ensuring that high-quality resources are available to all educational institutions, regardless of financial constraints.

To ensure that generative AI contributes to educational equity, a collective effort is required from educators, administrators, policymakers, and developers. The digital divide—whether in access to technology, digital literacy, or premium AI tools—must be addressed to prevent further widening of educational inequalities. AI literacy is crucial, not only for students but also for educators and parents, as the responsible and effective use of AI will shape future learning environments. At the same time, AI development teams must emphasize diversity in the creation of educational AI tools and in the datasets used to train them. This will help reduce biases and make AI systems more adaptable to the needs of learners from diverse backgrounds. Furthermore, ongoing monitoring of AI systems for biases and inaccuracies is necessary to ensure that AI technologies do not reinforce harmful stereotypes or create unfair learning environments. Finally, AI literacy should be promoted as a fundamental competency in all educational settings. By teaching students and educators how to work with AI systems effectively and ethically, and by ensuring equitable access to these tools, generative AI can play a transformative role in creating more inclusive, accessible, and equitable learning environments.

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