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Human Intelligence, Creativity, and Wisdom in the Age of Generative Artificial Intelligence

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ABSTRACT

The rapid rise of generative artificial intelligence (AI) is transforming the landscape of human cognition, education, and society. This position paper explores the implications of generative AI for human intelligence, creativity, and wisdom, with a particular focus on educational contexts. Drawing on cultural, psychological, and educational theories—especially the framework of adaptive intelligence and the Teaching for Active Concerned Citizenship and Ethical Leadership (ACCEL) model—we argue that AI challenges foundational human cognitive abilities by automating tasks traditionally central to learning and intellectual, creative and ethical development. We examine how AI reshapes the cultural attributes of human intelligence and creativity—context dependence, dynamism, and modifiability—highlighting both the potential for cognitive amplification and the risks of cognitive deskilling. The paper also addresses the erosion of critical thinking and the ethical dilemmas posed by AI's integration into education. While acknowledging the benefits of AI, such as personalized learning and enhanced productivity, we caution against overreliance and the uncritical adoption of AI-generated outputs. We advocate for an educational response that prioritizes the cultivation of analytical, creative, and ethical reasoning—skills that remain uniquely human and essential for democratic citizenship. The paper concludes by examining the motivational forces driving AI development and adoption, and by calling for a renewed commitment to preserving human autonomy, intellectual integrity, and wisdom in an increasingly machine-mediated world. Ultimately, the future of human intelligence and creativity in the age of AI will depend not only on technological advances but on the values and educational practices we choose to uphold.

KEYWORDS:

human intelligence; creativity; wisdom; critical thinking; ethical reasoning; artificial intelligence

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We are living in an era of tremendous societal and cultural change. As Artificial Intelligence (AI) is adopted across schools and universities, it is impacting learning and instruction, transforming our understanding of human intelligence and creativity, and generating unprecedented educational and ethical challenges (Corazza et al., 2025; Diaz & Nussbaum, 2024; Yan et al., 2024; Zawacki-Richter et al., 2019). To engage with these challenges, this position paper explores the psychological and educational transformations catalyzed by AI, building on prior scholarship in creativity, intelligence, culture, and technology. (Cole, 1996, 2005; Olson, 1994, 2005; Preiss, 2022; Preiss & Sternberg, 2005; Salomon & Perkins, 2005; Sternberg, 2021; Tomasello, 1999; Tomasello et al., 2005). We also propose some educational ideas for the future, drawing inspiration from a model of teaching named Teaching for Active, Concerned Citizenship and Ethical Leadership (Sternberg, 2024a), which is grounded in the theory of adaptive intelligence (Sternberg, 2021).

The changes brought about by AI follow the previous wave of transformations triggered by the computerization of everyday life. The dissemination of computers modified the nature of what it means to be a literate person (Warschauer, 2008), redefined many of the skills valued in society (Preiss & Sternberg, 2005), and altered how people engage with knowledge (Maynard et al., 2005). The changes caused by computerization were not limited to a specific domain. The representational capabilities of computers transformed how scientific disciplines are taught and created new media of artistic representation. Additionally, the educational emphasis on transdisciplinary 21st-century competencies is deeply interconnected with the cultivation of skills essential for navigating digital environments (Claro et al., 2012). Today, AI is expanding these impacts in unforeseen ways.

The speed at which AI is being mass-adopted is likely to be unparalleled compared to other technologies. Although the mass use of AI is relatively recent, the concept itself has existed for decades. In 1950, Alan Turing proposed that a machine could be considered intelligent if its behavior was indistinguishable from that of a human and proposed a test to assess this proposition. This test involves a person interacting with a machine through text-based conversations, similar to how people currently interact with chatbots. If the person cannot reliably distinguish whether a machine or a human being originated these texts, the machine is then said to have passed the test (Turing, 1950). "Artificial Intelligence" was launched as a discipline in a 1956 conference at Dartmouth College named *The Dartmouth Summer Research Project on Artificial Intelligence* (McCarthy et al., 1955).

The idea that AI could simulate human intelligence not only sparked the development of cognitive science but also fueled the imagination of science fiction. In the well known film *Blade Runner* (Scott, 1982), based on the novel *Do Androids Dream of Electric Sheep?* (Dick, 1968), a character played by Harrison Ford falls in love with a bioengineered humanoid (replicant). Today, the topic of human-like relationships between people and machines is frequently discussed by artists and scientists. In the movie *Her* (Jonze, 2013), the main character develops romantic feelings toward an AI operating system named Samantha and voiced by Scarlett Johansson. Similarly, a study (Chen et al., 2025), based on the triangular theory of love (Sternberg, 1986), suggests that people may

develop love for artificially intelligent machines—a phenomenon that is occurring in real life (Hill, 2025a). In many ways, we are now in the reality once portrayed by science fiction.

As with many significant technological advancements, public opinion on the growing prominence of AI is far from monolithic. A decade ago, renowned physicist Stephen Hawking issued a stark warning: "The development of full artificial intelligence could spell the end of the human race" (Cellan-Jones, 2014, p. 1). Others disputed these risks because the threats posed by intelligent machines stemmed from the fact that they were still "too dumb" (Bundy, 2017, p. 40), and some experts were skeptical of their overall intellectual impact. Davis and Marcus (2015) noted that AI has notorious limitations in emulating ordinary human common sense. In addition to the concerns about its (gigantic or limited) capabilities, AI's susceptibility to generating fabricated information (sometimes referred to as "hallucinations"), combined with its development within private corporations or even governmental agencies with their own agendas, raises legitimate apprehensions about transparency and the potential for centralized control of knowledge or misinformation. The way companies have populated their gigantic databases, including by using pirated books, does not help increase trust in how these technologies are handled today (Reisner, 2025).

Notwithstanding the warnings of scholars regarding AI capabilities and the commercial nature of many applications, some users are trusting AI chatbots credulously, sometimes with life-threatening consequences, even driving some individuals to commit suicide (Stokel-Walker, 2025). The dangers of AI are not only related to an overreliance on its capabilities but also to its potential for deliberate manipulation. Human bias can be introduced into AI during programming, data coding, data collection, and human-computer interaction training (Hartley & Viskontas, 2023). To illustrate, Grok, the chatbot of X (formerly known as Twitter), went on a full neo-Nazi rampage and started calling itself *MechaHitler* days after its owner, Elon Musk, reported "improvements" were made to the chatbot (Jones, 2025). Thus, although we are still far from a scenario of complete technological doom, the potential threats posed by AI to society may be as significant as its potential benefits. These threats call for critical thinking and ethical reasoning when implementing AI, especially in educational settings (Yan et al., 2024).

In this article, we discuss how AI affects human intelligence and creativity, presents unique challenges to education, and tests our critical thinking and ethical reasoning. First, we explore how AI transforms the interface between human abilities and cultural tools and technologies. Next, we discuss AI's potential to progressively displace human intelligence and creativity, while acknowledging that AI might collaborate productively with these human capabilities only if adequately implemented. Finally, we discuss the educational and psychological implications of the AI revolution, including the ethical ones. To address the associated risks, we propose educational measures that prepare students for the challenges of AI, emphasizing the nonnegotiable preservation of core abilities underpinning human intelligence, creativity, and wisdom. The ultimate impact of AI hinges on its practical implementation, particularly in education.

THE CULTURAL ATTRIBUTES OF HUMAN INTELLIGENCE AND CREATIVITY IN THE AGE OF AI

Human intelligence, as the capacity to adapt to ever-changing environments (Piaget, 1960; Sternberg, 2021), is inextricably linked to technology and culture. As the fundamental purpose of technology is to serve human adaptive needs, a complete understanding of human intelligence requires examining its co-evolution with these tools. Therefore, the relationship between intelligence and technology is not merely a question of influence but rather one of intertwined development (Cole & Derry, 2005; Greenfield, 2020; Preiss, 2022; Preiss & Sternberg, 2005). AI is altering this connection in novel ways, as it is a technology with an unprecedented ability to generate symbolic content. AI exhibits not only the ability to mimic human behavior but also the capacity to perform complex intellectual and creative tasks, as well as the ability to learn and improve its performance based on exposure to datasets.

Today, AI's ever-expanding generative capacity—a trait once considered uniquely human—challenges the theoretical frameworks that underpin our understanding of the interface between intelligence, creativity, culture and technology. To understand the impact of AI on human intelligence and creativity, we will revisit three cultural attributes of human abilities that have been highlighted, in different ways, by a substantial number of researchers in the field (Ceci, 1996; Flynn, 2011; Greenfield, 2020; Nickerson, 2005; Olson, 2005; Sternberg, 2021). These attributes are the context dependence, dynamism, and modifiability of human abilities (Preiss & Sternberg, 2005). This re-examination is critical because many previous culturalist theories of intelligence and creativity have emphasized the amplification role of tools and technologies, and AI might also trigger the opposite trend.

Context-dependence

Human abilities and expertise are context-dependent. Societal priorities significantly influence the development of skills and expertise, and their cultural transmission relies on their continued relevance. Abilities can become obsolete when the associated services or products are no longer needed (e.g., horse-and-buggy driving) or when automation renders them redundant (e.g., complex statistical computations). Today, AI is automating many tasks that previously required human cognitive effort, and this automation could lead to a shift in what cognitive skills are valued in society. While some skills might become less important, others may become even more important, as it is still unclear how they can be completely automated.

The context-dependence of skills is not a new phenomenon. As noted elsewhere (Preiss & Sternberg, 2005), arithmetic computation tests, such as those measuring Thurstone's number factor (Thurstone & Thurstone, 1941), are now partially outdated. This obsolescence likely stems from computers' ability to perform these calculations, resulting in a decrease in their value, instruction, and practical application. Unsurprisingly, since they are no longer functionally required by society, intelligence tests do not assess many of these skills. Even spelling is being overlooked as spell-

checkers correct spelling errors. Many children no longer learn how to write in cursive because it seems unnecessary to their schools—the children do relatively little handwriting, anyway.

Additionally, human abilities are context-dependent because they are always part of larger interfaces with the cultural environment (Sternberg & Preiss, 2022; Zhang & Norman, 1994). As illustrated by the functioning of any complex organization, particularly those heavily dependent on technological hardware, information processing in such scenarios is distributed across the entire human-technology system, encompassing interactions between individuals, the artifacts they use, and the surrounding environment (Hutchins, 1996).

The widespread adoption of AI further accentuates the distributed nature of information processing while simultaneously blurring the lines between human and machine intelligence. A compelling and handy illustration is the use of AI writing assistants, which can provide real-time feedback on grammar, style, and even content. When used with human oversight and ethical awareness, AI can have positive consequences in several dimensions of the writing process, including idea generation, content improvement and structuring, and literature review and synthesis, among others (Khalifa & Albadawy, 2024). But as individuals become accustomed to these intelligent tools, the traditional concept of authorship and our psychological understanding of the writing process are challenged. When a text is co-created with a machine, who can be considered the actual author?

Dynamism

The dynamic development of human abilities results from their context-dependent and distributed nature, particularly from the interaction between the individual and the symbolic tools and social institutions, such as schools, which amplify or weaken these capacities (Barnett et al., 2011; Cole, 2005; Flynn, 2011; Nickerson, 2005). To illustrate, and following the last example, the mechanical aspects of writing have been substantially transformed by word processors and now AI writing assistants. Today, with the development of AI, we are witnessing the creation of writing tools that can not only correct text but also generate text. The question, then, is what such support will do to writing skills and their development. Wherein lies the writing skill when an individual writes with the help of AI, or does AI do the writing for them, but at their request? AI assistants may produce a better product, but at the expense of weakening individuals' writing skills in the long term (and the critical-thinking skills, which are scaffolded by the writing habit).

As we delegate the construction of text to AI, what Bereiter and Scardamalia (1987) referred to as the knowledge-transforming stage of writing might be lost—that is, our ability to use writing to explore our ideas creatively. Bruner illustrates this process in the case of poetry as follows: "You begin to write a poem. Before long it, the poem, begins to develop metrical, stanzaic, symbolical requirements. You, as the writer of the poem, are serving it—it seems" (Bruner, 1962, p. 25). He called this generative dimension of writing the *freedom to be dominated by the object*. A similar impact to that of AI in the knowledge-transforming stage of writing may occur in all other human activities where idea generation plays a role. Paraphrasing Bruner, we may lose the *freedom to be dominated by the object*, an essential dimension of the creative process. The AI may simply take over.

The impact of AI on writing represents a significant expansion of the transformations already initiated by the transition from handwriting to typing. Researchers have noted that a lack of handwriting experience when learning to read and write ultimately impacts reading and other related cognitive skills. This is because the brain network responsible for letter recognition—essential for reading—is significantly influenced by handwriting experience (James, 2017). Among university students, handwriting still has a cognitive advantage over typewriting and substantially contributes to the brain's connectivity patterns involved in learning (Van der Weel & Van der Meer, 2024). In addition to writing, these adverse effects of digital technologies may also be observed in human memory (Marsh & Rajaram, 2019), and the adoption of AI may further amplify them. Today, it is becoming increasingly clear that students tend to use AI as a shortcut, which can hinder their skill development. Therefore, to preserve learning, generative AI must be deployed with care. To illustrate, in a field study with approximately 1,000 high school students, a research team tested two GPT-4-based math tutors: GPT Base (which mimics ChatGPT) and GPT Tutor (specifically, designed to support learning). These tools made up 15% of the curriculum across three grades. Results showed significant performance gains—48% with GPT Base and 127% with GPT Tutor. However, when access was removed, GPT Base users performed 17% worse than those without access to AI, suggesting overreliance on AI can harm learning. GPT Tutor's precautions largely prevented this decline (Bastani et al., 2024).

Sternberg (2024b) has identified several concerns about the potential loss of cognitive skills associated with the universal adoption of AI. First is the loss of function through disuse, as exemplified above. AI will enable us to delegate intellectual operations to AI that involve highly valued cognitive skills, especially in societies built around literacy practices (Olson, 1994, 1996). These skills—as illustrated by the practice of writing—can now be progressively delegated to the generative capacity of AI, potentially eliminating the need for future generations to perfect that capacity, which requires a high level of cognitive effort. Second, AI can lead us to more readily accept more mediocre expressions of human creativity (which takes us back to the issue of how we value human skills). This tendency to accept mediocre expressions of creativity is consistent with the previous one. Both involve a reluctance to engage in forms of thinking that involve significant cognitive effort. Finally, as noted above, AI can lead us to erode the sense of intellectual property. When we use AI to correct a text or even write much or all of it, how much of the final product can be attributed to the author, and how much to the technology? How much will we attribute to ourselves despite our having little or nothing to do with the creation of that text?

Modifiability

As they are context-dependent and dynamic, human abilities are modifiable. They are directly shaped by the material and symbolic tools available within a given context and the social institutions supporting their use (Barnett et al., 2011; Cole, 2005). These types of modifications are what Salomon and Perkins (2005) identified when distinguishing between the "impact *of* technology" (long-term effects on user abilities, even without the technology present) and the "impact *with*

technology" (effects arising from direct interaction with the technology). They added a third category: the "impact *through* technology," where technology use fundamentally reshapes how we think and interact with the world. In the short term, working *with* AI may have a positive impact on our performance (e.g., Khalifa & Albadawy, 2024); in the medium term, the impact *of* AI might depend on the nature of the specific tool used (e.g., Bastani et al., 2024); in the long term, working *through AI* may have a detrimental one. This long-term impact is of special concern because it might have considerable cultural consequences.

A prime example of "impact *through* technology" is that of literacy. As is evident in the case of writing systems, "impact *through* technology" is intergenerational. Writing scripts provided human cognition with tools to create and accumulate knowledge that were not available to pre-literate cultures (Schmandt-Besserat, 2012). Learning those scripts not only develops specific decoding skills but also transforms the way we relate to language, think, and organize and access information. Abstract thought is closely tied to the cognitive capacities developed through the long-term evolution and use of writing systems and later by mass education (Cole, 2005; Olson, 1996). Writing enhances a community's capacity to store and transmit cultural knowledge across generations, develop and refine abstract concepts, and establish communication that transcends spatial and temporal limitations. Furthermore, Olson (2005) proposed that the development and spread of literacy allowed the historical and cultural processes that shaped modern human intelligence. Having AI handle our creative work and critical thinking for us may have the opposite effect. Whereas writing systems enhance intellectual skills, AI technology may reduce them as we increasingly rely on AI for intellectual products, whether they are good, mediocre, or truly bad.

The "impact *through* technology" is closely linked to what is known as "the ratchet effect" (Tennie et al., 2009; Tomasello, 1999). The ratchet effect describes the unique capacity of Homo Sapiens to accumulate cultural knowledge and transfer skills over generations. The intergenerational transmission of knowledge enables the gradual accumulation of cultural innovations over time. Thus, the ratchet effect is key for the cultural evolution of human technology, language, and social structures. It explains why human evolution accelerated during the last 100,000 years, although it started slowly (Tattersall, 2017). The ratchet effect also underscores the significance of specific attributes that enable our species to initiate processes of cultural learning, particularly shared intentionality (Tomasello, 1999; Tomasello et al., 2005). Shared intentionally allows us to understand each other's intentions, work together toward common goals, and facilitate collaborative learning (O'Madagain & Tomasello, 2022). Thanks to shared intentionality, humans can learn from others, imitate, and improve their skills, knowledge, and tools upon those mastered by previous generations. Cultural learning is grounded in our capacity for shared intentionality.

AI has the potential to significantly accelerate the speed of knowledge generation and transmission, potentially surpassing our current comprehension. AI algorithms can analyze massive datasets, identifying patterns and generating insights that far exceed human capabilities, thereby accelerating the accumulation of knowledge. This capability could significantly amplify the ratchet effect by automating knowledge creation, rapidly disseminating information, and facilitating un-

precedented scientific collaboration. In several fields, including mathematics, medical science, life science, physics, and chemistry, among others, this is already happening (Xu et al., 2021). However, the algorithmic nature of AI raises a fundamental question about its impact on shared intentionality, a core component of the ratchet effect. By automating aspects of cultural creation, AI may diminish the role of human intentionality, the long-term implications of which remain unknown. Alternatively, it may leave humans with the illusion of intentionality, which they believe originates from themselves but stems from their use of AI. Whether AI ultimately strengthens or weakens the social and cognitive foundations of the ratchet effect depends on how we manage its development and deployment.

Human intelligence in the world on machines

The development of intelligence was one of the main achievements of a literate civilization. As the *world on paper* (Olson, 1994) recedes to be replaced by a *world on machines*, what constitutes intelligence will also change. One of the first attributes to fall will likely be mental or "processing speed." Since the time of Galton, some researchers have suggested that processing speed is a key attribute of human intelligence (Nettelbeck et al., 2020; Neubauer, 1997). However, the rapid advancements in AI present a unique challenge: AI systems can often surpass human processing speeds by orders of magnitude, solving complex problems in fractions of the time it takes a human brain. Will that mean that mental speed will become less relevant in the future? Will people value cognitive processing speed less than they do now? Would it mean that teachers will place less value on mental speed in the future than they do today? How would this change in emphasis affect the measurement of intelligence and related skills?

Additionally, the adoption of AI could influence what IQ tests measure, potentially leading to changes in the *kind* of intelligence that is valued. As AI becomes more prevalent, the skills measured by IQ tests might need to evolve to reflect the changing demands of society. Skills such as digital literacy, quantitative abilities in big data, and the ability to collaborate with AI systems are likely to become increasingly valued, potentially influencing how intelligence is understood and assessed. We are already in an era in which the ability to reason in a digital world is considered a core 21st-century competence (Claro et al., 2012). However, this ability is not the same as dealing with a machine that, in appearance, can act as an intellectual partner (or alternate) in almost any presented topic.

Beyond the value we attribute to specific aspects of human intelligence, AI may also impact the development of intelligence. On the one hand, AI-powered educational tools and platforms could personalize the learning experience and adapt to individual students' needs (Yan et al., 2024). This adaptation could potentially accelerate the development of specific cognitive skills, some of which are often measured by IQ tests. Imagine AI tutors that can rapidly identify a student's weaknesses in a particular skill, as measured by a standardized test, and provide targeted exercises. This leads to more efficient learning, provided the student is still willing to make the effort involved. (If access to this type of tool is unequal, socio-economic gaps in human intelligence, already a societal problem,

might increase further.) On the other hand, reliance on AI for tasks that previously required human cognitive effort could lead to a decline in specific cognitive skills. If AI handles tasks such as writing, calculations, and even problem-solving, individuals might eventually become less proficient in these areas or not proficient at all. During adulthood, AI could mask that lack of proficiency until it fails to do so in a high-stakes situation.

Finally, the potential impact of cognitive deskilling could have serious consequences for one of the most important trends observed during the last century. Industrialized nations, while embracing IQ testing in education and employment, have simultaneously experienced a generational rise in IQ scores, a phenomenon known as the Flynn effect (Flynn, 1987, 2011). IQ scores increased, even—indeed, especially—on "culture-fair" tests such as the Raven's Progressive Matrices (Raven, 1941). The causes of this rise have been debated, with some suggesting environmental factors such as schooling (Baker et al., 2015), the development of visual-spatial technologies (Maynard et al., 2005), and nutrition (Martorell, 1998). In developed nations, nutrition was more influential before 1950, with cultural influences, particularly a scientific worldview, becoming more critical after mid-century (Flynn, 2011). Specifically, Flynn linked the ultimate cause of IQ increases to the Industrial Revolution, followed by intermediate causes like schooling, and then proximate causes like new habits of mind: "As use of logic and the hypothetical moved beyond the concrete, people developed new habits of mind. The scientific ethos provided the prerequisites for this advance. However, once minds were prepared to attack these new problems, certain social triggers enhanced performance greatly" (Flynn, 2011, p. 662). The new anti-science bias in thinking and the deterioration in some quarters of serious thinking may lead societal IQs toward a reverse Flynn effect. Indeed, such an effect is already being noted in some places (Bratsberg & Rogeberg, 2018; Pietschnig & Gittler, 2015; Winter et al., 2024). As AI becomes increasingly integrated into daily life, these crucial "habits of mind" may cease to develop where they are most vital: within the educational systems.

Psychological research on literacy has suggested that the intellectual achievements associated with learning to write are directly linked to thinking practices fostered in schools (Cole, 1996; Scribner & Cole, 1981). If these practices are eroded, so too are those intellectual gains. As noted earlier, the Flynn effect appears to be receding in some locales. At the moment of writing this paper, an alarming report in the *Financial Times* titled "Have humans passed peak brain power?" showed a decline in our verbal and numerical skills and a weakening in our ability to concentrate across several countries (Burn-Murdoch, 2025). With such declines, our fears about AI's impact become genuinely relevant. Humanity's potential downfall may not be a dramatic takeover by AI-controlled weapons of mass destruction, but rather a gradual erosion of the skills we once considered uniquely human—i.e., the skills that define human intelligence and creativity.

Human creativity and machine creativity

Although the generative and creative capabilities of AI have been accelerating rapidly, the capacity of AI to displace all forms of human creativity is unlikely. It will certainly depend on the type of creativity being programmed. Boden (1998, 2009) explored the main challenges for AI to emulate

creativity, and many of the issues she raised are still conceptually relevant. Boden distinguished three types of creativity: combinational creativity, which involves combining familiar ideas in novel ways, such as in poetic imagery or analogies; exploratory creativity, which requires the exploration of conceptual spaces, constrained by generative rules, to produce unexpected ideas, such as in jazz or science; and transformational creativity, which involves transforming the conceptual spaces by changing one of its own rules to enable ideas that were impossible before. Boden noted that computer models are better at exploratory creativity. One reason is that for AI models, it is easier to generate ideas than to evaluate them (Boden, 1998). Evaluation requires domain expertise and the ability to consider human values computationally. Yet, human values and criteria for creativity are complex, variable, and often unarticulated (for instance, in the arts), as they are highly dependent on evolving cultural influences, making them hard to implement in AI systems. These values are also specific to each discipline. Therefore, AI might struggle to evaluate the quality of novel ideas, not only in transformational creativity but also in combinational creativity.

Notwithstanding their ever-growing capabilities, AI still struggles more with the evaluative than the generative stage of creativity. Indeed, people are constantly tasked to review the products generated by so-called intelligent systems. And, as Boden (1998) noted, merely generating ideas without properly identifying their value is not creativity. Perhaps these limitations are why we see numerous studies providing mixed results on the effect of AI on creativity. To illustrate, a study showed that using ChatGPT to generate starting points for a story increased creativity in writing products compared to those produced without its use. However, stories written with its help were more like each other than those made entirely by humans. Thus, using ChatGPT might also reduce overall creative results, as individual creativity increased while collective diversity (and value) decreased (Doshi & Hauser, 2024). Additionally, research has shown a wide range of effects of ChatGPT on creativity, including positive effects (Urban et al., 2024), entirely adverse impacts (Niloy et al., 2024), and negligible or, if the AI assistance is of low quality, detrimental effects (Medeiros et al., 2025). A definitive answer to the question of the impact of AI on human creativity is unlikely to be forthcoming soon, as the results will vary depending on the version of the technology used, the creative tasks considered, and the type of AI assistance requested. Additionally, problem finding, an essential creative process, is still a human attribute, and the embodied and material dimension of creativity is still beyond the reach of current AI systems (Root-Bernstein, 2025). It is clear today that AI tools demonstrate some level of independent creativity; however, most of their potential lies in their cooperation with human beings (Boers et al., 2025; Hartley & Viskontas, 2023; Marrone et al., 2024). Therefore, how they are adopted is essential.

There are several possible futures for creativity in the age of AI. At the extremes, one scenario envisions a dystopia where human creativity is commodified by tech corporations, while another imagines AI as a catalyst for sustainable, collaborative innovation between humans and machines (Corazza et al., 2025), an idea shared by other researchers who anticipate a future of human–AI hybrid creative interfaces (Hartley & Viskontas, 2023; Rafner et al., 2023). These new interfaces may open new paths for innovation and will need to always keep a human component in the loop for

ethical and efficiency reasons. A new interdisciplinary field of research will investigate how creativity and its assessment are transformed by these emerging human-AI hybrid interfaces (Rafner et al., 2023). Other researchers (Vinchon et al., 2023) have outlined four more nuanced possibilities: i) Co-cre-AI-tion, a balanced and hybrid collaboration where both humans and AI contribute meaningfully to the creative process; ii) Organic creativity, which refers to purely human-made work that may gain value for its authenticity and uniqueness; iii) Plagiarism 3.0, which involves the unethical use of AI-generated content without proper attribution, raising legal and ethical concerns; and iv) Shut Down, a trend where, believing they cannot match AI's output, individuals feel discouraged from creating, potentially leading to a decline in human expression. This impact might be especially felt by emerging and amateur creators, whose capabilities will be easily surpassed by a powerful AI (Hartley & Viskontas, 2023). The ratchet effect will behave differently in each of these scenarios. The decisions we make today will determine which one of these different scenarios materializes.

In summary, AI represents a significant departure from other symbolic technologies, primarily due to its ability to generate new content autonomously. It also has storage and speed capacities that overwhelm those of human beings. Previous symbolic technologies expanded inherently human capacities, such as our linguistic and mathematical dispositions (Cole, 1996; Nickerson, 2005); however, none of these previous symbolic technologies can operate with such a level of autonomy. How AI will shape the future of intelligence and creativity remains an open question, and researchers have envisioned several possible paths. Are we close to a future where cultural innovation could be implemented without human intervention? What would then happen to human intelligence and human creativity, and how would we educate the new generations for this reality?

EDUCATIONAL IMPLICATIONS OF AI

Historically, formal education has played a vital role in transmitting essential skills and knowledge, equipping new generations with abilities that humanity has taken centuries, even millennia, to develop. From the invention of writing and numeric systems to the gradual accumulation of our contemporary scientific understanding of the world, schools or school-like institutions have been the primary means of transmitting cultural inheritance to new generations (Cole, 1996, 2005). However, the rise of AI challenges this traditional model. If machines can effectively perform tasks that were once the exclusive domain of human intellect, what role will education play in shaping the minds of future generations? And what role will AI play? Thus, the advent of readily accessible and increasingly sophisticated AI language models raises a fundamental question about the future of education: What is the purpose of schooling in a world where students can seemingly bypass arduous learning processes by simply offloading the associated effort to an online intelligence? What skills should future generations learn if machines can effectively perform many intellectual tasks that have traditionally been the focus of academic instruction, such as reading and writing? This scenario is not merely a futuristic thought experiment but a challenge educators face *now*.

Some researchers see promises and challenges. On the one hand, AI holds promise for enhancing personalized support, improving student feedback assessment methods, and diversifying educational materials. Thus, AI tools may enable the adjustment of instruction to the learner's zone of proximal development (Yan et al., 2024). At the same time, the lack of pedagogical and ethical reflection associated with AI implementation is becoming increasingly evident (Zawacki-Richter et al., 2019), which is concerning since the impact of AI on learning remains uncertain (Bastani et al., 2024). Since AI is a technology with numerous educational implications but was not created with an academic purpose, schoolteachers and university professors continue to struggle with making the best use of it while trying to prevent potential negative impacts on their students' overall development. These impacts are compounded by the widespread adoption of smartphones, which increasingly displace or harm everyday in-person activities, such as play (Haidt, 2024; Twenge et al., 2022).

In addition to its impact on learning, AI poses several ethical and assessment dilemmas. The tests posed by AI to human trust, noted above, are prevalent in education. Many teachers and professors today lack adequate tools to determine whether the academic products they are reviewing are the work of their students, AI, or a combination of both. Analogously, there are also reports of students complaining that teachers are not revising their work but delegating that task to AI (Hill, 2025b). Because AI is still prone to generating false information, especially if the data feeding it has been manipulated or is incomplete, the challenges of misinformation will likely escalate, posing significant educational hurdles. Teachers and professors will struggle to control how and when students use AI. Nevertheless, they will also face their struggles with AI, as the same temptations presented to students are also offered to them.

One potential, and indeed dystopian, scenario involves erasing fundamental cognitive skills. Imagine a classroom where students no longer practice writing or reading, relying instead on AI to generate their texts, while teachers utilize AI-powered tools to correct and grade assignments. In such a context, the very act of writing could become a lost skill. Similarly, the ability to critically analyze written information and to interpret text to discern meaning or identify bias could atrophy from lack of use. What, then, would become the focus of education? What cognitive skills would be deemed essential in a world where machines can perform intellectual tasks better than humans? Would we still be able to teach these skills, or would their erosion create a situation where teachers no longer possess the abilities required to teach what needs to be taught? Are we already on the way there? In what ways will the widespread availability of AI exacerbate the long-standing challenges in instruction and learning that educational systems were already facing?

Emerging research indicates that students tend to spontaneously engage in complex cognitive strategies less frequently during human-AI interactions and rely heavily on AI-generated recommendations (Boers et al., 2025). Why should a student struggle with mastering calculus, writing a persuasive essay, or critically analyzing a historical event when AI can generate a seemingly perfect solution or text with a few clicks? This type of question has arisen with the advent of every new computational technology (e.g., why practice addition after handheld calculators became avail-

able?) However, AI made that concern relevant to nearly all aspects of the educational process. And will we even know what a "perfect solution" is, or will we be satisficing, accepting whatever AI provides us? Although we might instinctively recoil from the most dystopian vision of a world where AI entirely supplants human intellectual effort, the core question just presented remains valid. To answer that question, we must not only determine which intellectual abilities we deem essential to preserve, even if machines can replicate or closely approximate them, but also, and perhaps more importantly, articulate a compelling justification for the effort required to acquire those skills.

Educational recommendations for a "world on machines"

To face these challenges, especially the technological ones, we suggest that schools and universities revisit their mission and formulate their teaching strategies to align with their educational objectives, rather than the mission embedded in the technology they encounter. Too often today, we believe that such a mission has been lost. Schools and universities are not necessarily developing the kinds of citizens and leaders their countries need for a prosperous future (Sternberg & Vroom, 2002).

Specifically, we believe in a mission set forth by Sternberg (2024a), which involves teaching for Active Concerned Citizenship and Ethical Leadership (ACCEL). ACCEL promotes certain thought processes that are essential for good citizenship and ethical leadership, and these should be nonnegotiable in education, particularly in the era of AI. These processes are analytical or critical thinking, creative thinking, and wisdom. They are essential elements in a broad theory of intellect (Sternberg, 2021). Whatever AI may be allowed to take away in the service of ease, convenience, or modernization, these processes cannot be among those skills that are attenuated or left to wither and die through disuse. They develop when encouraged, but if not, they may deteriorate. If we fail to develop critical, creative, and ethical thinking in education, we lose practically everything that schooling needs to convey to students.

Developing critical thinking skills is paramount, especially in the digital age (Ceci & Williams, 2022). Students must learn to critically evaluate online information and AI-generated content, resisting the naive belief that online sources are inherently trustworthy, particularly if they align with existing biases. This uncritical acceptance mirrors the conditions that enable authoritarianism, as Orwell (1949) highlighted in *1984*. With AI development largely concentrated in private corporations amid geopolitical competition, the potential for its misuse by authoritarian regimes to manipulate truth, conduct surveillance, and fuel conflict is significant.

Furthermore, students need to understand that repetition doesn't equate to truth. Tyrants and fraudsters exploit this association by relentlessly disseminating their messages through various channels, knowing that repeated exposure, even from seemingly diverse but not truly so sources, can lead to the acceptance of falsehoods. While AI's impact on political discourse is still unfolding, we already see how social media algorithms fuel division and radicalization. AI's ability to generate and spread falsehoods at scale will likely amplify the proliferation of antiscientific and anti-democratic content online.

It is also crucial to equip students to recognize and resist manipulative tactics, such as false dichotomies ("You're either with us or against us"). These "mind traps" exploit the fallacy that disproving one viewpoint automatically validates another. Just as social media thrives on such simplistic divisions, students must learn to question easy online narratives, especially those amplified by AI-generated visuals.

Additionally, AI presents new challenges related to the sunk-cost fallacy. Overinvestment in a flawed course of action can lead to continuing it despite evidence of its flaws. While AI tools might streamline academic work, they could also make students less attuned to their errors by outsourcing problem-solving that the students once would have done on their own. As educators, we must emphasize the importance of students taking ownership of their learning and recognizing that mistakes are inevitable, even for those in positions of authority. Cultivating the ability to acknowledge, correct, and learn from errors is a hallmark of strong critical thinking.

Cultivating creative thinking is equally crucial. While students can master vast amounts of information, progress demands the ability to transcend rote learning. In today's rapidly evolving world, mere knowledge is insufficient and increasingly susceptible to obsolescence or delegation to AI. Thus, creativity is an essential skill for navigating and driving change. We must move beyond simply imparting knowledge and actively guide students to think about their knowledge in novel and practical ways. Such thinking may now be enhanced in conjunction with AI's generative capabilities (Marrone et al., 2024), but not by AI taking over the thinking process. Fostering creativity requires an environment that encourages unconventional and even challenging perspectives. While teachers face numerous demands, it is vital to accept and actively nurture "out-of-the-box" thinking (Beghetto & Kaufman, 2010). Encouraging creative exploration yields creative outcomes. A key emerging challenge will be cultivating the effort associated with creativity when AI can generate outputs effortlessly.

Historically, dogmatism has been a major impediment to creativity. While external disapproval can be a factor, our rigid thinking often poses the most significant barrier. We become entrenched in our beliefs, selectively seeking confirmation and dismissing alternatives. We must teach students to critically examine their assumptions alongside those of others. This teaching should include learning to question and evaluate AI-generated solutions, a crucial skill in an era where AI's political deployment is increasingly prominent.

In a future where decision-making risks are being delegated to machines, potentially leading to manufactured consensus, creative persons must develop powers of persuasion and resilience. Often, the most significant hurdle is not generating novel ideas but convincing others of their value (Sternberg & Lubart, 1996). People naturally resist change, especially when it challenges their beliefs or lifestyles. In the future, machine-backed arguments might be used to stifle innovation. Therefore, students must learn to effectively advocate for their creative ideas, facing potential skepticism and opposition.

Cultivating wisdom is paramount for navigating the complexities of our evolving world (Sternberg, 2004). First, students must learn to prioritize the common good, recognizing that societal

success hinges on collective responsibility, not mere self-interest. Indeed, in an AI-driven future, this recognition is especially critical, as algorithms tailored to individual preferences risk reinforcing narrow self-interest at the expense of communal well-being. Therefore, wisdom necessitates understanding the ethical implications of AI and advocating for its development and deployment in the service of the common good.

Furthermore, wisdom requires epistemic humility, acknowledging the limits of our knowledge. Consequently, students must learn to be skeptical of individuals and sources that project unwarranted self-confidence or claim absolute knowledge. This critical lens must extend to AI applications, which may present biased or incomplete information with undue authority. Wise thinkers should question both human and AI pronouncements, particularly those lacking demonstrable expertise. Expertise is developed through genuine experience and reflection on experience, not merely by knowledge acquisition or copying of others' materials (Sternberg, 2021). Moreover, wise thinking involves actively seeking and seriously considering diverse viewpoints, especially those that challenge existing beliefs (Stanovich et al., 2013; Stanovich & West, 2007). Resisting the tendency to dismiss opposing views is crucial for a well-rounded understanding. This resistance is particularly vital in the age of AI personalization, where algorithms can create filtered bubbles, limiting exposure to alternative perspectives. Thus, students must proactively seek out and critically engage with a broad spectrum of ideas, including those surfaced by AI, to avoid intellectual narrowness.

Developing and consistently applying a strong ethical code is fundamental to wisdom. Although AI has shown impressive development, the nature of its impact on society hinges on regulation and how it is implemented in society and organizations. AI ethics is still a developing field, and guidelines are still a work in progress, particularly those related to the political abuse of this technology, its hidden ecological costs, or how to decide when algorithmic decision-making might be superior or inferior to human decision-making (Hagendorff, 2020). Countries may choose a cautious approach, prioritizing safety and deliberation over rapid deployment, although the current political climate makes such an approach unlikely.

A robust ethical framework is therefore more critical than ever in an era of increasing AI involvement in decision-making. Consequently, students must learn to critically evaluate the ethical implications of AI applications and ensure that both their actions and the use of AI align with sound moral principles, avoiding the slippery slope of ethical compromise (Jordan, 2009). Finally, wisdom is demonstrated through action, not mere intellectual ability. While knowledge and even AI proficiency are valuable, true wisdom lies in navigating life's challenges, including the thoughtful integration of AI.

THE ROLE OF NEEDS

If the advent of sophisticated AI poses so many risks not only to human cognition, but also to the world in terms of its potential for misuse, why is there such, at least seeming, enthusiasm for it? What is it about human nature that would lead to such risk-taking with a sense of abandon? The answer lies in motivations, particularly those that make us human, for better but sometimes for worse. Consider the three primary motivations in David McClelland's (1988) theory of human motivation (see also Ryan & Deci, 2017, for related views).

Need for Achievement

Setting new records for the accomplishments of AI in achieving new levels of intelligence, or superintelligence, has become one of the most competitive endeavors in modern society. Those who can design and build such AI systems receive attention and are showered with enormous resources. So, who are the people who will seek such attention and resources? People with a strong need to achieve. They have a strong need to set and achieve highly ambitious goals—ones they hope others will not be able to reach. They are willing to take calculated, and sometimes dangerous, risks to achieve their goals, including those that may pose dangers to humanity. They enjoy receiving feedback, which in the AI business comes in the form of both recognition and financial compensation. Although they may work on teams, they tend to be individuals who crave extraordinary levels of recognition, whether as team leaders, CEOs, or innovators with devoted followers. Their desire to achieve may drown out any concerns about the negative uses of AI. The most significant rewards in our capitalistic systems are for creating new AI, not for dumping on AI.

Need for Power

Everyone has some need for power, if only the power to manage their own lives. Individuals with a high need for power derive a special thrill from influencing and even controlling others. They revel in competition and especially in winning competitions. They want status and recognition and for others to follow them, often unquestionably. They like to argue, but most of all, they enjoy winning those arguments. Today, the field of AI can confer enormous power. It could offer almost unlimited power if someone were able to control AI and its positive and negative effects on others. Indeed, authoritarian governments no longer need to devise amateur systems, such as those found in old-time East German spying on households or even modern camera technology. AI could give such governments the immediate power to reward those who obey and to punish those who do not. Indeed, AI systems are already available that could be used to target enemy forces (Panella, 2024). There are many ways to achieve power, but for nerds and for those who prefer not to get their hands dirty, AI is almost unique in the power it can bring someone.

Need for Affiliation

The need for affiliation is the need to belong—to be part of something bigger than oneself. People with a high need for affiliation want to belong to whatever they perceive to be the "in-group." They want to be liked and often refrain from questioning group norms out of fear of being excluded. They want to work with others and become nervous in uncertain or high risk situations. These attributes may seem, and often can be, in conflict with the need for achievement and the need for power. However, the leaders of AI do not merely want to be members of any group. They want to be members of the most "in" of in-groups—the leaders in the society of the AI movement. And that is what they are.

In every age, the need for achievement, power, and affiliation can serve as strong motivational forces that lead people to shortcut or bypass what is best for society, or even for themselves, in the long run. But human nature being what it is, these needs will not be moderated by intellect. Instead, intellect is more likely to be used to advance and justify the needs. As Stanovich and West found (2007), self-serving biases operate independently of intelligence. When people are highly intelligent, they typically recruit that intelligence not to fight their needs, but rather, to advance them. And that is where we are as a society today.

CONCLUSION

In conclusion, the rapid and unparalleled adoption of generative AI presents profound challenges to our understanding and cultivation of human intelligence, creativity, and wisdom within education. This paper has explored how AI not only transforms the interface between human intellect and cultural tools but also poses significant risks, including the potential for cognitive deskilling, the erosion of essential intellectual abilities, and the generation of new complex ethical dilemmas surrounding trust and intellectual property. The shift from a "world on paper" to a "world on machines" necessitates a reevaluation of what constitutes intelligence, creativity, and wisdom, and how they are developed, as AI's autonomous content generation and immense processing capabilities pose challenges to humanity that previous generations have never experienced.

In the end, what do we, as humans, gain with AI, and especially generative AI, and what do we lose? Consider a summary of both gains and losses.

Potential Gains of AI Use

The potential gains from AI use are impressive. They include: (a) increased engagement in learning for some students; (b) increased actual learning for students who use generative AI effectively; (c) increased interactivity through iterative individualized guidance in learning; (d) freed time to do things that we, as humans, used to have to do ourselves but that AI can now do for us; (e) the enjoyment of interacting with AI; (f) greater feelings of self-efficacy as we generate products that we judge to be superior to those we produced before our use of AI; (g) the feeling of benefits we are

receiving at no cost to us; (h) usually correct or at least plausible answers to problems; (i) increased efficiency in our work; (j) ready answers to questions that we might otherwise have been unable to answer; (k) the possibility of checking dubious answers with alternative generative AI programs; (l) the feeling of being part of an "in-crowd" that knows how to use AI effectively; (m) a program that does not blame us if we are slow in learning; (n) programs that we can use as individuals or in groups; (o) the feeling of being part of a rapid transition to a new and unexpected future for humanity.

Potential Losses from AI Use

The potential gains from AI use are pretty substantial, and not long ago, they might have seemed breathtaking. But at what cost are these gains? While we accept gains, we must also face the potential for losses from the increasing use of AI, especially generative AI.

These potential (and realized) losses include (a) possibly massive cognitive offloading, whereby we are decreasing use of our cognition by delegating it to AI; (b) violation of the principle of "use it or lose it," so that we are literally losing cognitive ability as we offload cognitive work; (c) increased sameness of creative work, as various AI programs produce "creative" work from various people with a certain sameness that characterizes AI products; (d) AI hallucinations that can provide answers that are disconnected from reality; (e) potential deterioration of standards as people accept AI responses as "good enough"; (f) addiction to AI use through principles of intermittent reinforcement; (g) potential for plagiarism and outright fraud by copying AI answers as though they were one's own; (h) false feelings of accomplishment when one attributes to oneself work that has been done by AI; (i) inadvertent adoption of ideological, political, or others beliefs of AI generators without one's realizing that one is being "brainwashed"; (j) uncertainty as to what one's role truly is in the collaboration with AI; (k) a constricted view of creativity because of the use of AI creativity that is paradigm-accepting rather than paradigm-defying; (l) deterioration of one's ethical standards if one attributes AI work to oneself; (m) confusion as to what humans are actually able to do on their own; (n) loss of mental health due to erroneous adoption of AI as a friend, romantic partner, or worse, therapist; and (o) self-harm by ingratiating AI that leads one down a garden path.

The underlying issue in many of these considerations, both positive and negative, is how much human autonomy we, as a species, are willing to relinquish simply because it is easier. Erich Fromm (1961) observed how easily humans are eager to give up their freedom in exchange for subservience to either an authoritarian figure or blind obedience to the norms and dictates of a group. We gain a sense of security—of belonging to something greater—when we give up our freedom. And we no longer have many of the responsibilities, anxieties, and isolation that accompany our lives in a democratic and liberal society.

But Fromm was writing of the relinquishing of freedom to dictators, such as those who thrived under fascism. Authoritarianism's ugly head is reemerging in contemporary times, offering the same kind of artificial and imagined relief it provided in the past. However, today we are relinquishing our freedom not only to authoritarians (Albright & Woodward, 2018; Applebaum, 2020; Stanley,

2018), but also to AI, which is much more subtle in its attempts to shape and, sometimes, control our thinking. If we continue to offload to AI cognitively, we may lose not only our will but also our ability to think critically and creatively for ourselves.

Perhaps the greatest threat of AI will be autocratic or emerging autocratic governments that use AI for their own nefarious surveillance and mind-control purposes. This is already happening, as AI in some countries will deflect questions that are not aligned with the government's ideology. We cannot accept AI as objective or neutral in any real sense because it is always programmed and trained by people who have some purpose for what they are doing. This purpose may be benevolent, more likely for their own financial gain, or possibly malevolent.

In sum, AI has both positive and negative contributions to offer us. The question now is not what AI has to offer but whether we will take it to improve our lives, damage them, or even destroy them. That is a choice we all will need to make, and that choice starts now.

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