First an Overview

You should be skeptical of AI's effectiveness – almost no research supports it

Williamson '24 concludes (Ben Williamson is a Chancellor's Fellow at the Centre for Research in Digital Education and the Edinburgh Futures Institute at the University of Edinburgh. Alex Molnar is a Research Professor at the University of Colorado Boulder. Faith Boninger is NEPC's Publications Manager and Co-Director of NEPC's Commercialism in Education Research Unit and holds a PhD from Ohio State University. Williamson, B. Molnar, A., & Boninger,
F. (2024). "Time for a pause: Without effective public oversight, AI in schools will do more harm than good." Boulder, CO: National Education Policy Center. http://nepc.colorado.edu/publication/ai) //Bellaire MC

AI in Education Since the 1960s, scientists and technology companies have explored ways to apply AI in education. AI in Education (AIED) is a major field of research and development.55 The AI applications being promoted to schools today were preceded in the 1960s and 1970s by "Intelligent Tutoring Systems" and "Computer Assisted Instruction" systems.56 Since the early 2000s, researchers have gathered, stored, and analyzed massive quantities of educational data with the intention of informing institutional and instructional strategies.57 These approaches are now routinely considered synonymous with AIED, and have also been rapidly commercialized by the ed tech industry.58 Most AIED applications employ big data and machine learning to produce various predictions and automated actions—such as predicting that a student may fail an assessment or creating a "personalized" intervention intended to produce a desired learning outcome.59 Research on AI in education has developed and tested various approaches and reported modest effectiveness on measurable learning achievement—performance on quizzes and tests, for example.60 Current excitement about its potential is motivating both public and private sources to generously fund researchers trying to find ways to improve learning outcomes using AI.61 However, the assumption that AI in education can be understood primarily as a technical matter best addressed by scientists and companies is increasingly challenged by researchers who argue that a narrowly technical perspective may lead to both bad policy and bad pedagogy.62 They point out that AI exists in social, economic, and political contexts that shape its development and uses.63 How AI is adopted by different educational stakeholders (including AIED researchers, ed tech entrepreneurs, corporate leaders, and policymakers) will have significant implications for its use in schools.64 The fact that entrepreneurs and corporations funded by venture capital and private equity are rushing to promote AI in education will inevitably narrow possible applications to those preferred by stakeholders with financial interests.65 Small-scale ed tech start-ups and Big Tech corporations alike see AI as an opportunity,66 leveraging popular hype to market such education products as personalized learning programs, automated lesson plan generators, and AI tutoring chatbots, called "tutorbots," to schools.67 **Compelling evidence** for the effectiveness of tutorbots in education **remains scarce**,68 though this does not prevent entrepreneurs and researchers from proclaiming their usefulness.69 Policymakers routinely invoke AI rhetorically, calling on schools to embark on "digital transformation,"70 often with little attention to social, economic, legal, or ethical implications.71 These calls dovetail with existing political priorities on performance monitoring, account, ability, efficiency, and effectiveness—all of which require extensive collection of data about students.72 Although systems of test-based accountability have existed in schools since the 1990s,73 they will expand and intensify as AI is used to continuously monitor and assess student learning.74 As a result, commercial AI systems will increasingly serve as private actors in public education as schools, districts, and governments relinquish key tasks, functions, and responsibilities to third-party technology vendors.75 Existing and potential uses of AI in education are not merely innovative technical add-ons to teaching and learning practices or engineering solutions to schools' existing pedagogic and administrative problems. Rather, AI in education has been spurred by multiple forces: longstanding efforts by scientists to measure, predict, and support learning processes and outcomes; commercial aspirations to profit from selling products to schools; and the political objective of being perceived as having improved school efficiency and accountability while cutting costs. As things currently stand, these ambitions have begun to coalesce into a vision of AI-driven schooling in which commercial products assess student learning, automate teaching, and make decisions about student progress. Inadequate Research Base

Despite the **extensive research in** the field of **AI** in **Education** (AIED) and the burgeoning research on machine learning, **there is remarkably little evidence to support claims of AI's ability to "transform" schools.**76 While AIED researchers have produced many research findings, their studies tend to focus primarily on measures of individual student engagement and performance (assessed by standardized achievements tests), or on "engineering" problems such as designing increasingly sophisticated algorithms and enhancing machine learning effectiveness.77¶ Overall, AIED **studies** tend to **find ambiguous results, lack independence and scale, and** fail to address more fundamental questions about educational goals.78 AIED research therefore often promotes a view of education transformation as improving measurable individual outcomes despite very limited evidence that AI "works."79 In effect, such studies **reduce** well-researched and **nuanced theories of how humans learn** to whatever can be made **into a mathematical model** (however complex), and they ignore the contested terrain of exactly which goals and curriculum public schools should embrace.80 Moreover, claims that AI can solve major educational problems—such as lack of qualified teachers, student underachievement, and educational inequalities—rely to a considerable extent on **conjecture rather than evidence.**81¶ **Even more problematic are the serious methodological flaws** in machine learning research that call into **question** the **validity of hundreds of studies.**82 The nature of the flaws, in general, leads toward "over optimism" with respect to the usefulness and value of machine learning applications in a variety of fields.83 These findings are particularly concerning because they call into question not only commercial marketing claims, but also the scientific evidence base supporting the widespread implementation of AI systems in all sectors,84 including education. Finally, because of the very high computing costs associated with running machine learning models, most **[and] researchers** have to rely on systems from the dominant AI companies themselves in order to conduct research85—the same corporations that often fund AI studies.86 This makes research **depend**ent **on corporate** resources, **funds**, and business practices, **giving AI firms considerable**

influence over not only AI development, but also the academic **research** that depends on their systems.87 It also compromises an important part of the research process, which is reproducing findings to verify their validity. **When** a

company changes or **stops** supporting **a particular model, researchers cannot reproduce studies conducted earlier**.88 This **renders** the **research** base **unstable and unverifiable**—and thus unusable as a basis for assessing subsequent models.

Teachers

Society is facing a massive teaching crisis, even with years of gen AI

White 25[Scott White, March 7, 2025, "Teacher Funding Cut As National Shortage Reaches Breaking Point", I have worked in college admissions and college counseling for over 40 years, and have written extensively on the college admissions process. I have served as the Director of Guidance at Morristown High School, as a school counselor and Director of Guidance at Montclair High School, and as Director of College Counseling at Montclair Kimberley Academy. My early experience as an admissions counselor at Bard College was vital to my understanding of college admissions. I have been a featured expert on CBS Sunday Morning, the Washington Post's Answer Sheet and in most major national publications. I currently work as an independent college counselor, Forbes, https://www.forbes.com/sites/scottwhite/2025/03/07/teacher-funding-cut-as-national-shortage-reaches-breaking-point/]

==America's education system is facing a crisis that threatens to undermine the future of millions of student==s: ==a severe and growing teacher shortage.== This issue, simmering for years, has reached a boiling point as ==schools nationwide struggle to fill classrooms with qualified educators.== Compounding the problem is a recent decision by the Trump administration to eliminate federal funding for teacher preparation programs, which has sparked lawsuits and intensified the debate over how to address the shortage. The stakes are high, and the consequences of inaction could reshape the educational landscape for decades.

It has been and gets worse with AI.

Marshall et al. 25 [David T. Marshall, Teanna Moore & Timothy Pressley, 2-4-2025, David T. Marshall is an associate professor of educational research at Auburn University. "Tech Aims to Reduce Teacher Burnout – But it Can Sometimes Make it Worse," No Publication, https://www.the74million.org/article/tech-aims-to-reduce-teacher-burnout-but-it-can-sometimes-make-it-worse/, DOA: 2-21-2025] //beta squad

When we set out to study pandemic-related changes in schools, we thought we'd find that learning management systems that rely on technology to improve teaching would make educators' jobs easier. Instead, we found that teachers whose schools were using learning management systems had higher rates of burnout.

Our findings were based on a survey of 779 U.S. teachers conducted in May 2022, along with subsequent focus groups that took place in the fall of that year. Our study was peer-reviewed and published in April 2024.

During the COVID-19 pandemic, when schools across the country were under lockdown orders, schools adopted new technologies to facilitate remote learning during the crisis. These technologies included learning management systems, which are online platforms that help educators organize and keep track of their coursework.

We were puzzled to find that teachers who used a learning management system such as Canvas or Schoology reported higher levels of burnout. Ideally, these tools should have simplified their jobs. We also thought these systems would improve teachers' ability to organize documents and assignments, mainly because they would house everything digitally, and thus, reduce the need to print documents or bring piles of student work home to grade.

But in the follow-up focus groups we conducted, the data told a different story. Instead of being used to replace old ways of completing tasks, the learning management systems were simply another thing on teachers' plates.

A telling example was seen in lesson planning. Before the pandemic, teachers typically submitted hard copies of lesson plans to administrators. However, once school systems introduced learning management systems, some teachers were expected to not only continue submitting paper plans but to also upload digital versions to the learning management system using a completely different format.

Asking teachers to adopt new tools without removing old requirements is a recipe for burnout.

Teachers who taught early elementary grades had the most complaints about learning management systems because the systems did not align with where their students were at. A kindergarten teacher from Las Vegas shared, "Now granted my kids cannot really count to 10 when they first come in, but they have to learn a six digit student number" to access Canvas. "I definitely agree that … it does lead to burnout."

In addition to technology-related concerns, teachers identified other factors such as administrative support, teacher autonomy and mental health as predictors of burnout.

Why it matters

Teacher burnout has been a persistent issue in education, and one that became especially pronounced during and after the COVID-19 pandemic.

If new technology is being adopted to help teachers do their jobs, then school leaders need to make sure it will not add extra work for them. If it adds to or increases teachers' workloads, then adding technology increases the likelihood that a teacher will burn out. This likely compels more teachers to leave the field.

Schools that implement new technologies should make sure that they are streamlining the job of being a teacher by offsetting other tasks, and not simply adding more work to their load.

The broader lesson from this study is that teacher well-being should be a primary focus with the implementation of schoolwide changes.

AI increases teacher burnout because it forces them to adapt their curriculum to prevent cheating Shah 24

Priten **Shah** (Priten Shah is an education entrepreneur and the author of AI & The Future of Education: Teaching in the Age of Artificial Intelligence (Jossey-Bass, 2023). He is the founder of Pedagogy.Cloud, an educational consulting firm that supports educators in K-12 schools, higher education, and the nonprofit sector adapt to the increasing capabilities of AI.

), 6-5-20**24**, "I Was an AI Optimist. Now I'm Worried It's Making Teacher Burnout Worse (Opinion)," Education Week, https://www.edweek.org/technology/opinion-i-was-an-ai-optimist-now-im-worried-its-making-teacher-burnout-worse/2024/06, accessed 2-27-2025]//beta squad

<u>Seemingly overnight, understanding AI technology</u> went from being a niche skill to <u>an essential life skill,</u> While many ==**educators**== across the country have diligently spent their free time, prep periods, and summer vacations pursuing professional development, an overwhelming majority ==**are**== rightfully ==**daunted by the prospect of learning how to navigate**== this ==**new technology**==. ==**The learning curve**== for many educators ==**has been**== much ==**steep**==er than is being acknowledged. The prospect of learning a brand-new tool can be overwhelming as you learn its features, capabilities, and limitations, and how it works best for you. Using AI tools also involves learning more than just the user interface of a new tool; it requires our educators to learn how this technology works to feel empowered to use it responsibly and have meaningful conversations with their students about it. For others, ==**the technology remains unaffordable as**== ==**major**== ==**tools**== ==**begin to**== ==**paywall their strongest features**==. ==**Absent support from their district,**== ==this== often ==**means that**== ==**many teachers have an additional expense**== that ==**they must pay out of pocket to use**== these technologies in the powerful ways advertised. ==**This**== only ==**further**== ==**limits**== **the number of teachers who are seeing the benefits of** developing ==**AI**== **literacy.** Even those who manage to find the time and money to pursue some professional development or are part of a small contingent of American teachers who receive resources from their schools still face the task of staying current with the developments and rapid changes that the AI space is currently undergoing. Schools and districts need to acknowledge the challenge AI creates for teachers who want to become active, responsible users of the technology. They must find space in their existing professional development schedules and allow teachers to spend meaningful time learning about and using AI technology in ways that can eventually reduce their workload. How AI has changed curriculum Part of the frustration we hear from educators is how ==**many**== of their ==**assignments need to be restructured**==, ==**given the ability for**== students to use ==**AI**== technologies ==**to complete**== **their homework** easily. ==**This has**== ==**creat[ing]ed a crisis for educators**== who assign out-of-class work, especially those who extensively use independent writing as an assessment tool. Teachers are facing the need to rethink their assessments and pedagogical practices, **with** very **little guidance on how to effectively** and sustainably **make these changes**. The definition of "AI-proof assignments" shifts so rapidly that it has become a relatively futile goal for educators to pursue. Some "AI proofing" has relied on generative AI's limited knowledge of recent events and its inability to perform math, while other anti-cheating efforts turned to now-defunct AI detectors or the lack of students' voices in writing. <u>As **AI programs continue to overcome**</u> these <u>**limitations,**</u> teachers will likely have to move toward different types of student assessments that capitalize on classroom time and use independent time only for preparatory work.

Human teachers are uniquely key for learning.

Walter 25, Walther, Cornelia C. "AI Is Changing How We Learn: The New Role of Human Teachers." Forbes, 1 Mar. 2025, Dr. Cornelia C. Walther is a humanitarian leader with 20+ years at the UN driving social change. Now a Wharton/University of Pennsylvania Fellow, she pioneers research on hybrid intelligence and prosocial AI through the global POZE alliance to build Agency amid AI for All. Her focus Is on harnessing AI to bring out the best in and for people and planet.www.forbes.com/sites/corneliawalther/2025/03/01/ai-is-changing-how-we-learn-the-new-role-of-human-teachers/ //beta squad

This incident highlights the tension between artificial and natural Intelligences: **while** ==**AI excels at processing data, it**== ==**lacks**== **the** ==**deeper dimensions of**== **human** ==**understanding**== **that characterize NI.** Natural Intelligence: A Multidimensional Framework. Going far beyond the rational thought process the type of intelligence that each of us is naturally equipped with operates on multiple levels that ==**AI can**==not ==**t replicate**==, so far: Personal Aspects: ==**Aspirations**==**: Our goals and visions** ==**that animate**== **us to** ==**learn[ing]**== **and give knowledge purpose.** ==**Emotions**==**: Empathy, compassion, and other feelings that shape how we interpret experiences.** ==**Thoughts: Logical reasoning**==**, creativity, and moral judgment that converge in our thinking.** <u>**Sensations:**</u> Our embodied awareness of the world that can trigger intuition or creativity.

When AI inserts scholarly sources that don't exist in the real world it does not come with the intent of deception in the human sense. **AI models don't understand truth or falsehood**; they merely generate patterns that mimic authoritative language. What makes this particularly challenging is the polished, articulate nature of AI outputs, which can easily convince even discerning readers. **This is precisely why teachers are irreplaceable. They help students develop cognitive agency** — **the ability to think independently despite technological shortcuts** — before entering workplaces where time pressures constantly tempt them to outsource their thinking. Just as physical strength requires consistent exercise, critical thinking is a muscle that atrophies without use. **Teachers serve as vital trainers, guiding students to flex their curiosity, creativity, and analytical skills in a world that increasingly rewards the passive consumption of machine-generated content.**

Can't be solved - AI can never be creative because it only alters previously known data.

De Cremer 21, *Professor in Management and Organizations at the NUS Business School at the National University of Singapore; Director of the Centre on AI Technology for Humankind at NUS Business School; **Chairman of the Human Rights Foundation, Founder of the Renew Democracy Initiative. *David De Cremer and **Garry Kasparov, "AI Should Augment Human Intelligence, Not Replace It," Harvard Business Review, 03-18-2021, https://hbr.org/2021/03/ai-should-augment-human-intelligence-not-replace-it // beta squad

In general, people recognize today's **advanced computers as intelligent because they have the potential to learn and make** decisions based on the information they take in. But while we may recognize that ability, it's a **decidedly different type of intelligence what we posses.**

In its simplest form, AI is a computer acting and deciding in ways that seem intelligent. In line with Alan Turing's philosophy, AI imitates how humans act, feel, speak, and decide. This type of intelligence is extremely useful in an organizational setting: Because of its imitating abilities, AI has the quality to identify informational patterns that optimize trends relevant to the job. In addition, contrary to humans, AI never gets physically tired and as long it's fed data it will keep going.

These qualities mean that **AI is perfectly suited to put at work in lower-level routine tasks that are repetitive and take place within a closed management system.** In such a system, the rules of the game are clear and not influenced by external forces. Think, for example, of an assembly line where workers are not interrupted by external demands and influences like work meetings. As a case in point, the assembly line is exactly the place where Amazon placed algorithms in the role of managers to supervise human workers and even fire them. **As the work is repetitive and subject to rigid procedures optimizing efficiency and productivity, AI is able to perform in more accurate ways to human supervisors.**

Human abilities, however, **are more expansive. Contrary to AI abilities that are only responsive to the data available, humans have the ability to imagine, anti[o]cipate, feel, and judge changing situations, which allows them to shift from short-term to long-term concerns.** These abilities are unique to humans and **do not require a steady flow of externally provided data to work as is the case with artificial intelligence.**

Education is essential for society

Serdyukov 17, Peter Serdyukov 17, Professor in the Department of Teacher Education at National University, 3/27/2017, "Innovation in Education: What Works, What Doesn't, and What to Do about It?" Journal of Research in Innovative Teaching & Learning, Vol. 10, No. 1, pp. 4–33, http://dx.doi.org/10.1108/JRIT-10-2016-0007 //beta squad

Education, being a social institution serving the needs of society, **is indispensable for society to survive** and thrive. **It** should be **not only comprehensive, sustainable, and superb, but must continuously evolve to meet** the **challenges of the fast-changing and unpredictable** globalized **world.** This evolution must be systemic, consistent, and scalable; therefore, school teachers, college professors, administrators, researchers, and **policy makers** are expected to **innovate** the **theory and practice of teaching and learning, as well as all other aspects of this complex organization to ensure quality preparation** of all students **to life and work.** Here we present a systemic discussion of educational innovations, identify the barriers to innovation, and outline potential directions for effective innovations. We discuss the current status of innovations in US education, what educational innovation is, how innovations are being integrated in schools and colleges, why innovations do not always produce the desired effect, and what should be done to increase the scale and rate of innovation-based transformations in our education system. We then offer recommendations for the growth of educational innovations. As examples of innovations in education, we will highlight online learning and time efficiency of learning using accelerated and intensive approaches. Innovations in US education **For** an individual, a nation, and **humankind to survive** and progress, **innovation and evolution are essential. Innovations in education are of particular**

importance because ==education plays a== ==crucial role== ==in== creating ==a== ==sustainable future==. "Innovation resembles mutation, the biological process that keeps species evolving so they can better compete for ==survival==" (Hoffman and Holzhuter, 2012, p. 3). Innovation, therefore, is to be regarded as an instrument of necessary and positive change. Any human activity (e.g. industrial, business, or educational) needs constant innovation to remain sustainable. The need for educational innovations has become acute. "It is widely believed that countries' social and economic well-being ==will== ==depend== to an ever greater extent ==on== the quality of their citizens' ==education:== the emergence of the so-called 'knowledge society', the transformation of information and the media, and increasing specialization on the part of organizations all call for high skill profiles and levels of knowledge. Today's education systems are required to be both effective and efficient, or in other words, to reach the goals set for them while making the best use of available resources" (Cornali, 2012, p. 255). According to an Organization for Economic Cooperation and Development (OECD) report, "the pressure to increase equity and improve educational outcomes for students is growing around the world" (Vieluf et al., 2012, p. 3). In the USA, underlying pressure to innovate comes from political, economic, demographic, and technological forces from both inside and outside the nation.

DPC 04: Which has long term impacts, as according to dropout Prevention Center 04, the dea

Dropout Prevention Center 04 [National Dropout Prevention Center, "Economic Impacts of Dropouts – National Dropout Prevention Center", 2004, Alliance for Excellent Education, no author quals https://dropoutprevention.org/resources/statistics/quick-facts/economic-impacts-of-dropouts/, Accessed 05/22/2023] //beta squad

Teen girls in the bottom 20% of basic reading and math skills are five times more likely to become mothers over a two-year high school period than teen girls in the top 20% (Alliance for Excellent Education, 2003b). Male and female students with low academic achievement are twice as likely to become parents by their senior year of high school, compared to students with high academic achievement (Alliance for Excellent Education, 2003b). ==The== U.S. ==death rate for those with fewer than 12 years of education is [250%]== 2.5 times ==higher== [250%] ==than the rate of those with 13 or more years of education== (alliance for Excellent Education, 200

Water Scarcity

The use of gen AI in education is growing Westfall 23[Chris Westfall, Jan 28, 2023,

"Educators Battle Plagiarism As 89% Of Students Admit To Using OpenAI's ChatGPT For Homework", Chris Westfall covers the changing nature of the leadership conversation. An international business coach to executives, entrepreneurs and aspiring leaders, he is the author of four books, and a ghost writer on eight more (including a Wall Street Journal Best-Seller). An international keynote speaker and frequent media guest, he has appeared on NBC, ABC NEWS, Bloomberg, BBC Radio and multiple broadcast outlets. His clients include influencers, Fortune 500 executives, entrepreneurs, political candidates, military leaders, professional athletes and global organizations. His entrepreneurial coaching clients have appeared on television shows like Shark Tank, Dragons Den in Canada and Shark Tank Australia. He regularly works with students across multiple disciplines at Texas A&M, where he has coached thousands of entrepreneurs, engineers and scientists - including the winners of the Rice Business Plan Competition in 2016 an 2023. He is a past recipient of the MBA top teaching award at Southern Methodist University's Business Leadership Institute. Latest book: Easier (Wiley). Contributor since: 2019., Forbes, https://www.forbes.com/sites/chriswestfall/2023/01/28/educators-battle-plagiarism-as-89-of-students-admit-to-using-open-ais-chatgpt-for-homework/]

Considering that ==90% of students are aware of ChatGPT==, and ==89%== of survey respondents report that they have ==used the platform to help with a homework assignment==, the application of OpenAI's platform is already here. More from the survey.

Gen AI only results in the use of more AI infrastructure Voruganti 23[Kaladhar Voruganti, August 7, 2023, "What Generative AI Means for Data Centers", Senior Business Technologist, https://blog.equinix.com/blog/2023/08/07/what-generative-ai-means-for-data-centers/] //JS

he original prompt you put into the AI engine is highly important in delivering good results. Generative AI query response times can be slower (in the order of multiple seconds) compared to that of traditional AI queries (with sub-second response times) because of the extra processing and larger data sets. ==Generative AI involves much larger AI==

training infrastructure and higher power consumption, thus **requiring denser server racks and advanced cooling techniques.** In many use cases, subject matter experts can interact directly with generative AI systems instead of going through data scientists. Data scientists are still required for foundational model customization. Because of **the high computation and infrastructure requirements to create AI** models from scratch, companies are starting to share AI models through Model as a Service and open-source AI model marketplaces.

That's bad-they consume too much water University of Tulsa 24[The

University of Tulsa, July 19, 2024, "Data centers draining resources in water-stressed communities", no author quals, https://utulsa.edu/news/data-centers-draining-resources-in-water-stressed-communities/#:~:text=Unfortunately%2C%20many%20data%20centers%20rely,thousands%20of%20households%20or%20farms.] //JS

The rapid growth of the technology industry and the increasing reliance on cloud computing and artificial intelligence have led to a boom in the construction of data centers across the United States. Electric vehicles, wind and solar energy, and the smart grid are particularly reliant on data centers to optimize energy utilization. These facilities house thousands of servers that require constant cooling to prevent overheating and ensure optimal performance. **Unfortunately**, many **data centers rely on water-intensive cooling systems that consume millions of gallons of** potable (**drinking**) **water annually.** **A single data center** can **consume[s] up to 5 million gallons of drinking water per day, enough to supply thousands of households** or farms. **The increasing use and training of AI models has further exacerbated the water consumption challenges faced by data centers.** Machine learning, particularly deep learning models, requires significant computational power, which generates a lot of heat. As a result, data centers housing these machine learning servers need even more cooling to maintain optimal performance and prevent overheating. Graphics processing units, which are commonly used to accelerate machine learning workloads, are known for their high energy consumption and heat generation..

Look to ChatGPT, a gen AI McNally 24[Paul McNally, April 3, 2024, "Critical impact-ChatGPT

consumes 500 ml of water for every 50 texts you send it", Paul McNally is the Founder of Develop AI, an innovative company that reports on AI, provides training and consulting services and builds AI tools. He is the Founder of podcasting company Develop Audio and the community radio non-profit Citizen Justice Network. He has received awards and recognition for his podcast Alibi and his influential book, The Street, that investigated corrupt cops and drug lords in Johannesburg. In 2016 he was a Visiting Nieman Fellow at Harvard. https://www.dailymaverick.co.za/article/2024-04-03-critical-impact-chatgpt-consumes-500ml-of-water-for-every-50-texts-you-send-it/]//JS

Similarly, as we ramp up towards a world of constantly generating content with AI, we are being asked to consider the environmental cost of its production. According to a paper published late last year, it is estimated that **ChatGPT is thirsty for 500ml of fresh water to generate** between **[just] five** and 50 **prompts** or questions. The range varies depending on where its servers are located and the season. The estimate includes indirect water usage which is needed to cool power plants that supply the data centres with electricity. And,

frankly, **this is only the beginning**... The big guys can't hide how much more water they now need. In this environmental report, Microsoft said that its **global water consumption spiked 34% from 2021 to 2022 (to over 6 billion litres)**. This is a sharp increase compared to previous years and researchers reckon this has to do with all its work with AI.

AI is taking more water than ever Rucker and Hill 24[Karah Rucker and Zachary Hill,
October 8, 2024, "AI tools consume up to 4 times more water than estimated", Karah Rucker is a morning anchor and reporter for Straight Arrow News. Her journalism career has spanned two of our largest states, covering news in Texas and California and Zachary is a Video Editor at Straight Arrow News. Straight Arrow News, https://san.com/cc/ai-tools-consume-up-to-4-times-more-water-than-estimated/]//JS

A new report shows that **a**rtificial **i**ntelligence tools, **including ChatGPT, are using up to four times more water than previously** believed. **This discovery raises concerns** about the sustainability of data centers **as AI continues to expand.** Researchers from the University of California, Riverside found that processing 10 to 50 queries on AI chatbots can consume up to 2 liters of water, far exceeding the earlier estimate of half a liter. The increase is attributed to the intense cooling needs of data centers, where

Firstly, gen AI is only hurting wildfires, look at California,Tobin 25[Taylor
Tobin, Jan 11, 2025, "ChatGPT Is Under Attack For Its Use Of Water — But How Does That Even Work?", Taylor Tobin is a Brooklyn-based food and lifestyle writer whose work can be seen in publications like Insider, Observer, Fairygodboss, and Apartment Therapy. She spends most of her free time on some combination of bikes, books, and bourbon.https://www.huffpost.com/entry/how-does-chatgpt-use-water_l_6782a3d6e4b0788bdb62b2ba] // JS

AI platforms can't generate content without the help of massive data center servers. These centers "contain thousands of high-performance computer chips that process user queries," explained Daniel Kearney, the chief technology officer of Firmus Technologies, which focuses on creating sustainable operating solutions for AI companies. "Because the computers and chipsets that power servers are so densely packed, they generate an incredible amount of heat. Running complex AI applications like **ChatGPT requires immense amounts of computing power**, which generate lots of heat 24 hours a day," explained HP Newquist, an artificial intelligence historian and the author of "The Brain Makers: Genius, Ego, and Greed in the Quest for Machines That Think." To prevent servers from crashing, cooling systems are put in place to help regulate data center temperatures. And, in many cases, "water is used to physically cool AI servers," explained Mia Montoya Hammersley, an assistant professor specializing in environmental law and the director of the Environmental Justice Clinic at the Vermont Law and Graduate School. So how much water are we talking about here? "Many of these systems rely on water to absorb and dissipate the heat through cooling towers or evaporative cooling methods," Kearney told us. "For some large facilities, this can mean using millions of gallons of water per year."The current wildfires were caused in part by drought affecting much of Southern California. "**With California already experiencing an ongoing drought, the water necessary to fight these fires is further straining the state's water supply**," Montoya Hammersley said. **"Water is a finite resource, and cutting back on AI use will have direct impacts on the state's water availability and ability to respond to this climate disaster."**

Waddick 25 explains

More than **12,000 homes**, businesses, schools and other structures **have been destroyed by** raging **wildfires** that began ripping **through** the Greater **L**os **A**ngeles area last Tuesday. Cal Fire said in an update Monday that a total of 40,300 acres have burned across multiple blazes including the Pacific Palisades fire west of Los Angeles, the Eaton Fire near Altadena and the Hurst fire near Sylmar. At least 24 people have died and more than **100,000 have been forced to flee their homes.**

But secondly, millions in the US suffer from a lack of water Shane 23 finds

They're not alone. **More than 46 million people in the U.S. live with water insecurity**—**either no running water or water that may be unsafe to drink.** Experts say at least $18.4 billion is needed over the next 10 years to bring water security to more people, although the Environmental Protection Agency and American Water Works Association estimates it would cost close to fully $1 trillion to replace and repair the U.S.' aging infrastructure. People are likely familiar with the water crises in Jackson and Flint, Michigan. In the former, flooding last summer overwhelmed the main water plant, and nearly 200,000 residents woke up to a boil water advisory; reports showed that high levels of lead in the city's drinking water were ignored for years. In the latter, toxic levels of lead in the water system—the result of aging, corroded pipes—sickened 100,000 residents and killed more than a dozen. But issues like this are happening all over the country in places like Tallulah, Louisiana; Grapeland, Texas; and parts of New Hampshire, Idaho, Kansas, Nevada, South Dakota, and Puerto Rico, where residents also don't have safe running water—their stories simply haven't made national headlines.

Water scarcity only results in deaths United Nations ND finds that

(Young girls fetch water at a communal water pump drilled by the United Nations Children's Fund (UNICEF) in Bubango, Tanzania.) According to the World Health Organization unsafe drinking water, inadequate availability of water for hygiene, and lack of access to sanitation together contribute to about 88 percent of deaths from diarrheal diseases, which kill 900 children under 5 years old per day according to new UN estimates, or one child every two minutes. UN-Water, the United Nations inter-agency coordination mechanism for all freshwater related issues including sanitation, concluded that the major

sources of water pollution are from human settlements and industrial and agricultural activities. Approximately **3.5 million people die each year due to inadequate water supply**, sanitation and hygiene.

Rebuttal:

A2 Innovation:

It's worse for research.

Jennifer **Ouellette 24**, 3/06/2024, Senior reporter at Ars Technica and the founding director of the National Academy of Sciences' Science and Entertainment Exchange, Producing more but understanding less: The risks of AI for scientific research, DOA: 2/26/2025, https://arstechnica.com/science/2024/03/producing-more-but-understanding-less-the-risks-of-ai-for-scientific-research/)//ejs squad

Last month, **we witnessed the viral sensation of several egregiously bad AI-generated figures published in a peer-reviewed article in Frontiers**, a reputable scientific journal. Scientists on social media expressed equal parts shock and ridicule at the images, **one of which featured a rat with grotesquely large and bizarre genitals.**

As Ars Senior Health Reporter Beth Mole reported, looking closer only revealed more flaws, including the labels "dissilced," "Stemm cells," "iollotte sserotgomar," and "dck." Figure 2 was less graphic but equally mangled, rife with nonsense text and baffling images. Ditto for Figure 3, a collage of small circular images densely annotated with gibberish.

The paper has since been retracted, but that eye-popping **rat penis** image will remain indelibly imprinted on our collective consciousness. The incident reinforces a growing concern that **the increasing use of AI will make published scientific research less trustworthy, even as it increases productivity.** While the proliferation of errors is a valid concern, especially in the early days of AI tools like ChatGPT, two researchers argue in a new perspective published in the journal Nature that **AI** also **poses potential long-term epistemic risks to the practice of science.**

Molly Crockett is a psychologist at Princeton University who routinely collaborates with researchers from other disciplines in her research into how people learn and make decisions in social situations. Her co-author, Lisa Messeri, is an anthropologist at Yale University whose research focuses on science and technology studies (STS), analyzing the norms and consequences of scientific and technological communities as they forge new fields of knowledge and invention—like AI.

The original impetus for their new paper was a 2019 study published in the Proceedings of the National Academy of Sciences claiming that researchers could use machine learning to predict the replicability of studies based only on an analysis of their texts. Crockett and Messeri co-wrote a letter to the editor disputing that claim, but shortly thereafter, several more studies appeared, claiming that large language models could replace humans in psychological research. The pair realized this was a much bigger issue and decided to work together on an in-depth analysis of how scientists propose to use AI tools throughout the academic pipeline.

They came up with **four categories of visions for AI in science.** The first is AI as **Oracle, in which such tools can help researchers search, evaluate, and summarize** the vast **scientific literature, as well as generate novel hypotheses. The second is AI as Surrogate**, in which **AI tools generate surrogate data points**, perhaps even replacing human subjects. **The third is AI as Quant.** In the age of big data, AI tools can overcome the limits of human intellect by **analyzing**

vast and complex datasets. Finally, there is **AI as Arbiter, relying on such tools to more efficiently evaluate the scientific merit and replicability of submitted papers, as well as assess** funding **proposals.**

Each category brings undeniable benefits in the form of increased productivity—but also certain risks. Crockett and Messeri particularly caution against three distinct **"illusions of understanding"** that may **arise from over-reliance on AI tools, which can exploit our cognitive limitations.** For instance, **a scientist may use an AI tool to model a given phenomenon and believe they**, therefore, **understand that phenomenon more than they actually do** (an illusion of explanatory depth). **Or a team might think they are exploring all testable hypotheses when they are only really exploring those hypotheses that are testable using AI** (an illusion of exploratory breadth). Finally, **there is the illusion of objectivity: the belief that AI tools are truly objective and do not have biases or a point of view, unlike humans.**

The paper's tagline is "producing more while understanding less," and that is the central message the pair hopes to convey. "The goal of scientific knowledge is to understand the world and all of its complexity, diversity, and expansiveness," Messeri told Ars. "Our concern is that **even though we might be writing more and more papers, because they are constrained by what AI can and can't do**, in the end, **we're** really **only asking questions and producing a lot of papers that are within AI's capabilities."**

Neither Crockett nor Messeri are opposed to any use of AI tools by scientists. "It's genuinely useful in my research, and I expect to continue using it in my research," Crockett told Ars. Rather, they take a more agnostic approach. "It's not for me and Molly to say, 'This is what AI ought or ought not to be,'" Messeri said. "Instead, we're making observations of how AI is currently being positioned and then considering the realm of conversation we ought to have about the associated risks."

Ars spoke at length with Crockett and Messeri to learn more.

Ars Technica: You're taking more of an epistemological approach to AI tools, particularly with regard to how scientists envision using them. Why?

Molly Crockett: **There's quite a lot of discussion right now about errors that AI makes and how those kinds of errors and inaccuracies are bad for science.** We agree that they're very dangerous. Our paper is actually more concerned with the future of science, **when all of those errors have been engineered away and the AI tools work exactly as their creators intend them to. Do we still get ourselves into trouble?** Lisa and I think that **we do.** Usually, there's hype that AI can do a particular thing, and the critique is, no, it can't do that thing. Ours is a different argument. People say, "Look at all these things that AI could do." We respond with, "Great, let's imagine they can do those things. Is that still the world we want?"

I'm a scientist, and I have used AI in my work, and I'm really excited about its potential. At the same time, over the last several years, these tools have become more sophisticated and, in many cases, less interpretable to human users. So, I've been growing more and more uneasy about what the widespread adoption of these tools bodes for the future of science. Lisa's scholarship and the broader world of Science and Technology Studies (STS) offers helpful frameworks for scientists to talk about what makes us nervous about this moment that we're in. Neither of our respective fields alone can really offer the insight that I think we need in this moment.

Lisa Messeri: STS is a vibrant, small field that began in the 1960s and 1970s out of concern for the future of science. Some of the earliest work was in the shadow of World War II and nuclear deterrence. It was this moment when scientists recognized that they had social roles in the world, that they weren't just sitting in an ivory tower but that the scientific knowledge they had created—in this case, a nuclear bomb—actually affected millions of people's lives. So a group of interdisciplinary scholars coming from the sciences, engineering, anthropology, sociology, philosophy, and history decided that in order to aid in this project of understanding science's impact on the world, we needed a set of tools and methods that can answer these questions.

In order to do so, we need to make a stunning claim: **Science is a human process and a human practice.** This has historically been misinterpreted. The discipline of STS has always walked a very tricky line because its goal is not to discredit science. As soon as you say that science is human, some people think it's a claim that science therefore isn't authoritative. That's not at all what STS is trying to do. It's saying instead that accepting the reality of the fact that **humans create science in social and cultural institutions might be the path toward a better, more robust, more authoritative, and more trustworthy science.** What robust science do we get if we take that radically different way of thinking about science in hand?

Ars Technica: I'd like to walk through each category in your taxonomy of how AI might be used by scientists. What are the good things that could come from each one, and what are the associated risks? Let's start with AI as Oracle.

Lisa Messeri: **AI as Oracle** is any application in which you **take a huge corpus of knowledge and from it get a set of discrete concrete answers or proposals.** It's a response to the overwhelming production of scientific knowledge: tools that can objectively and efficiently search, evaluate, and summarize scientific literature and also generate new hypotheses. There's an infinite amount of knowledge to be absorbed, and it only grows every day. Wouldn't it be nice if you could take an AI tool, train it on the existing corpus of published scientific literature, and then ask it to summarize everything, produce your literature review, identify what questions remain to be asked, or take all of the known findings in one subfield and extrapolate where these lead to?

The vision is seductive. It saves time, it's efficient, it will make us more productive. The main risk is that **it filters all these diverse questions through one narrow passage point, which is the AI tool.** There are studies where **teams were given diverse datasets** or given a diverse set of literature and asked to determine what is significant about this literature. **Depending on who you are, what questions you're asking, and what research questions you're interested in, you'll have a different answer.** That, in turn, **raises different questions you might ask of the literature.** If you don't have a single passage point through which you're filtering existing literature, you have a much wider base that you're building in terms of potential future projects. **If everything starts going through the same oracle to say what is or isn't in the literature, you automatically have a narrowing at the bottom.**

Many **AI tools reawaken the myth that there can be an objective standpoint-free science in the form of the "objective" AI.** But these AI tools don't come from nowhere. They're not a view from nowhere. They're a view from a very particular somewhere. And that **somewhere embeds the standpoint of those who create these AI tools: a very narrow set of disciplinary expertise**—computer scientists, machine learning experts. **Any knowledge we ask from these tools is reinforcing that single standpoint**, but it's pretending as if that standpoint doesn't exist.

Molly Crockett: I think every scientist has had the experience of being in a journal club where everyone has read the same paper and somebody else says something that you hadn't thought of. "Oh yeah, I totally missed that. Oh, that's a cool idea; that didn't occur to me." That's **the power of doing science in a community with diverse ways of thinking about the world.** My worry about **AI as Oracle** is that **we lose that diversity that makes science stronger. There are now studies showing** that on many different definitions of diversity, **more diverse teams produce science that is more robust**, that is **more impactful**, that is **more innovative.** This makes the retreat back to the myth of the singular objective knower all the more troubling.

That said, I have occasionally used AI-assisted literature search tools that turned up papers relevant to my project that I hadn't found. That was genuinely useful. AI as Oracle is problematic when it's used to narrow or reduce, but we hope people will think about use cases that might go in the opposite direction. The vision is more, not less—broader, not narrower.

Researchers don't <u>want</u> AI in studies -- prefer -- most recent and cites actual researchers

Wiggers 3/5 [Kyle Wiggers is a senior reporter at TechCrunch with a special interest in artificial intelligence. His writing has appeared in VentureBeat and Digital Trends, as well as a range of gadget blogs including Android Police, Android Authority, Droid-Life, and XDA-Developers. Experts don't think AI is ready to be a 'co-scientist', TechCrunch, https://techcrunch.com/2025/03/05/experts-dont-think-ai-is-ready-to-be-a-co-scientist/, 3.5.25] doa: 3.7.25 //ejs squad

Last month, Google announced the "AI co-scientist," an AI the company said was designed to aid scientists in creating hypotheses and research plans. **Google pitched it as a way to uncover new knowledge, but experts think it — and tools like it — fall well short of PR promises.** "This preliminary tool, while interesting, doesn't seem likely to be seriously used**," Sara Beery, a computer vision researcher**

at MIT, told TechCrunch. "I'm not sure that there is demand for this type of hypothesis-generation system from the scientific community." Google is the latest tech giant to advance the notion that AI will dramatically speed up scientific research someday, particularly in literature-dense areas such as biomedicine. In an essay earlier this year, OpenAI CEO Sam Altman said that "superintelligent" AI tools could "massively accelerate scientific discovery and innovation." Similarly, Anthropic CEO Dario Amodei has boldly predicted that AI could help formulate cures for most cancers. But many researchers don't consider AI today to be especially useful in guiding the scientific process. Applications like Google's AI co-scientist appear to be more hype than anything, they say, unsupported by empirical data. For example, in its blog post describing the AI co-scientist, Google said the tool had already demonstrated potential in areas such as drug repurposing for acute myeloid leukemia, a type of blood cancer that affects bone marrow. Yet the results are so vague that "no legitimate scientist would take [them] seriously," said Favia Dubyk, a pathologist affiliated with Northwest Medical Center-Tucson in Arizona. "This could be used as a good starting point for researchers, but [...] the lack of detail is worrisome and doesn't lend me to trust it," Dubyk told TechCrunch. "The lack of information provided makes it really hard to understand if this can truly be helpful." It's not the first time Google has been criticized by the scientific community for trumpeting a supposed AI breakthrough without providing a means to reproduce the results. TechCrunch Disrupt 2025 From AI and startups to space, fintech, and IPOs—experience game-changing insights across five main stages, breakouts, roundtables, unparalleled networking, and so much more. San Francisco, CA | October 27-29 REGISTER NOW In 2020, Google claimed one of its AI systems trained to detect breast tumors achieved better results than human radiologists. Researchers from Harvard and Stanford published a rebuttal in the journal Nature, saying the lack of detailed methods and code in Google's research "undermine[d] its scientific value." Scientists have also chided Google for glossing over the limitations of its AI tools aimed at scientific disciplines such as materials engineering. In 2023, the company said around 40 "new materials" had been synthesized with the help of one of its AI systems, called GNoME. Yet, an outside analysis found not a single one of the materials was, in fact, net new. "We won't truly understand the strengths and limitations of tools like Google's 'co-scientist' until they undergo rigorous, independent evaluation across diverse scientific disciplines," Ashique KhudaBukhsh, an assistant professor of software engineering at Rochester Institute of Technology, told TechCrunch. "AI often performs well in controlled environments but may fail when applied at scale." Complex processes Part of the challenge in developing AI tools to aid in scientific discovery is anticipating the untold number of confounding factors. AI might come in handy in areas where broad exploration is needed, like narrowing down a vast list of possibilities. But it's less clear whether AI is capable of the kind of out-of-the-box problem-solving that leads to scientific breakthroughs. "We've seen throughout history that some of the most important scientific advancements, like the development of mRNA vaccines, were driven by human intuition and perseverance in the face of skepticism," KhudaBukhsh said. "AI, as it stands today, may not be well-suited to replicate that." Lana Sinapayen, an AI researcher at Sony Computer Science Laboratories in Japan, believes that tools such as Google's AI co-scientist focus on the wrong kind of scientific legwork. Sinapayen sees a genuine value in AI that could automate technically difficult or tedious tasks, like summarizing new academic literature or formatting work to fit a grant application's requirements. But there isn't much demand within the scientific community for an AI co-scientist that generates hypotheses, she says — a task from which many researchers derive intellectual fulfillment. "For many scientists, myself included, generating hypotheses is the most fun part of the job," Sinapayen told TechCrunch. "Why would I want to outsource my fun to a computer, and then be left with only the hard work to do myself? In general, many generative AI researchers seem to misunderstand why humans do what they do, and we end up with proposals for products that automate the very part that we get joy from." Beery noted that often the hardest step

in the scientific process is designing and implementing the studies and analyses to verify or disprove a hypothesis — which isn't necessarily within reach of current AI systems. AI can't use physical tools to carry out experiments, of course, and it often performs worse on problems for which extremely limited data exists. "Most science isn't possible to do entirely virtually — there is frequently a significant component of the scientific process that is physical, like collecting new data and conducting experiments in the lab," Beery said. "One big limitation of systems [like Google's AI co-scientist] relative to the actual scientific process, which definitely limits its usability, is context about the lab and researcher using the system and their specific research goals, their past work, their skillset, and the resources they have access to." **AI risks AI's technical shortcomings and risks — such as its tendency to hallucinate — also make scientists wary of endorsing it for serious work. KhudaBukhsh fears AI tools could simply end up generating noise in the scientific literature, not elevating progress. It's already a problem. A recent study found that AI-fabricated "junk science" is flooding Google Scholar, Google's free search engine for scholarly literature. "AI-generated research, if not carefully monitored, could flood the scientific field with lower-quality or even misleading studies, overwhelming the peer-review process,"** KhudaBukhsh said. "An overwhelmed peer-review process is already a challenge in fields like computer science, where top conferences have seen an exponential rise in submissions." Even well-designed studies could end up being tainted by misbehaving AI, Sinapayen said. While she likes the idea of a tool that could assist with literature review and synthesis, Sinapayen said she wouldn't trust AI today to execute that work reliably. "Those are things that various existing tools are claiming to do, but those are not jobs that I would personally leave up to current AI," Sinapayen said, adding that she takes issue with the way many AI systems are trained and the amount of energy they consume, as well. "Even if all the ethical issues […] were solved, current AI is just not reliable enough for me to base my work on their output one way or another."

A2 Accessibility

AI is discriminatory and inherently can't incorporate outlier data
Eileen **O'Grady** (Eileen is the former managing editor of the The Scope at Northeastern University, an experimental digital magazine focused on telling stories of justice, hope and resilience in Greater Boston. She is also a former staff writer for The Shelburne News and The Citizen, with bylines in The Boston Globe, U.S. News & World Report, The Bay State Banner and VTDigger. She holds a BA in politics and French from Mount Holyoke College and a MA in journalism from Northeastern University.), 4-3-20**24**, "Why AI fairness conversations must include disabled people — Harvard Gazette," Harvard Gazette, https://news.harvard.edu/gazette/story/2024/04/why-ai-fairness-conversations-must-include-disabled-people/, accessed 2-25-2025 //ejs squad

"A lot of research so far has focused on how AI technologies discriminate against people with disabilities, how algorithms harm people with disabilities," Shah said. "My aim for this project is to talk about how even the conversation on AI fairness, which was purportedly commenced to fix AI systems and to mitigate harms, also does not adequately account for the rights, challenges, and lived experiences of people with disabilities." For his research, he's interviewing scholars who have studied the issue and evaluating frameworks designed to maintain AI fairness proposed by governments and the AI industry. Shah said developers often consider disability data to be "outlier data," or data that differs greatly from the overall pattern and is sometimes excluded. But even when it's included, there are some disabilities — like non-apparent disabilities — that are overlooked more than others. If an AI is trained on a narrow "definition" of disability (like if data from people who stutter is not used to train a voice-activated AI tool) the outcome will be that the tool is not accessible.