The Age of De-Skilling - The Atlantic

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The fretting has swelled from a murmur to a clamor, all variations on the same foreboding theme: “Your Brain on ChatGPT.” “AI Is Making You Dumber.” “AI Is Killing Critical Thinking.” Once, the fear was of a runaway intelligence that would wipe us out, maybe while turning the planet into a paper-clip factory. Now that chatbots are going the way of Google—moving from the miraculous to the taken-for-granted—the anxiety has shifted, too, from apocalypse to atrophy. Teachers, especially, say they’re beginning to see the rot. The term for it is unlovely but not inapt: *de-skilling*.

The worry is far from fanciful. Kids who turn to Gemini to summarize *Twelfth Night* may never learn to wrestle with Shakespeare on their own. Aspiring lawyers who use Harvey AI for legal analysis may fail to develop the interpretive muscle their predecessors took for granted. In a recent study, several hundred U.K. participants were given a standard critical-thinking test and were interviewed about their AI use for finding information or making decisions. Younger users leaned more on the technology, and scored lower on the test. *Use it or lose it* was the basic takeaway. Another study looked at physicians performing colonoscopies: After three months of using an AI system to help flag polyps, they became less adept at spotting them unaided.

But the real puzzle isn’t whether de-skilling exists—it plainly does—but rather what kind of thing it is. Are all forms of de-skilling corrosive? Or are there kinds that we can live with, that might even be welcome? *De-skilling* is a catchall term for losses of very different kinds: some costly, some trivial, some oddly generative. To grasp what’s at stake, we have to look closely at the ways that skill frays, fades, or mutates when new technologies arrive.

Our chatbots are new: The “transformer” architecture they rely on was invented in 2017, and ChatGPT made its public debut just five years later. But the fear that a new technology might blunt the mind is ancient. In the *Phaedrus*, which dates to the fourth century B.C.E., Socrates recounts a myth in which the Egyptian god Thoth offers King Thamus the gift of writing—“a recipe for memory and for wisdom.” Thamus is unmoved. Writing, he warns, will do the opposite: It will breed forgetfulness, letting people trade the labor of recollection for marks on papyrus, mistaking the appearance of understanding for the thing itself. Socrates sides with Thamus. Written words, he complains, never answer your particular questions; reply to everyone the same way, sage and fool alike; and are helpless when they’re misunderstood.

Of course, the reason we know all this—the reason the episode keeps turning up in Whiggish histories of technology—is that Plato wrote it down. Yet the critics of writing weren’t entirely wrong. In oral cultures, bards carried epics in their heads; griots could reel off centuries of

genealogy on demand. Writing made such prowess unnecessary. You could now take in ideas without wrestling with them. Dialogue demands replies: clarification, objection, revision. (Sometimes “Very true, Socrates” did the trick, but still.) Reading, by contrast, lets you bask in another’s brilliance, nodding along without ever testing yourself against it.

Eliezer Yudkowsky and Nate Soares: AI is grown, not built

What looks like a loss from one angle, though, can look like a gain from another. Writing opened new mental territories: commentary, jurisprudence, reliable history, science. Walter J. Ong, the scholar of orality and literacy, put it crisply: “Writing is a technology that restructures thought.” The pattern is familiar. When sailors began using sextants, they left behind the seafarer’s skycraft, the detailed reading of stars that once steered them safely home. Later, satellite navigation brought an end to sextant skills. Owning a Model T once meant moonlighting as a mechanic—knowing how to patch tubes, set ignition timing by ear, coax the car’s engine back to life after a stall. Today’s highly reliable engines seal off their secrets. Slide rules yielded to calculators, calculators to computers. Each time, individual virtuosity waned, but overall performance advanced.

It’s a reassuring pattern—something let go, something else acquired. But some gains come with deeper costs. They unsettle not only what people can do but also who they feel themselves to be.

In the 1980s, the social psychologist Shoshana Zuboff spent time at pulp mills in the southern United States as they shifted from manual to computerized control. Operators who had once judged pulp by touch (“Is it slick? Is it sticky?”) now sat in air-conditioned rooms watching numbers scroll across screens, their old skills unexercised and unvalued. “Doing my job through the computer, it feels different,” one told Zuboff. “It is like you’re riding a big, powerful horse, but someone is sitting behind you on the saddle holding the reins.” The new system was faster, cleaner, safer; it also drained the work of its meaning.

The sociologist Richard Sennett recorded a similar transformation at a Boston bakery. In the 1970s, the workers there were Greek men who used their noses and eyes to judge when the bread was ready and took pride in their craft; in the 1990s, their successors interacted with a touch screen on a Windows-style controller. Bread became a screen icon—its color inferred from data, its variety chosen from a digital menu. The thinning of skills brought a thinning of identity. The bread was still good, but the kitchen workers knew they weren’t really bakers anymore. One told Sennett, half-joking, “Baking, shoemaking, printing—you name it, I’ve got the skills.” She meant that she didn’t really need any.

The cultural realm, certainly, has had a long retreat from touch. In the middle-class homes of 19th-century Europe, to love music usually meant to *play* it. Symphonies reached the parlor not by stereo but by piano reduction—four hands, one keyboard, Brahms’s *Symphony No. 1* conjured as best the household could manage. It took skill: reading notation, mastering technique, evoking an orchestra through your fingers. To hear the music you wanted, you had to practice.

Then the gramophone took off, and the parlor pianos started to gather dust. The gains were obvious: You could summon the orchestra itself into your living room, expand your ear from salon trifles to Debussy, Strauss, Sibelius. The modern music lover may have been less of a performer but, in a sense, more of a listener. Still, breadth came at the expense of depth. Practicing a piece left you with an intimate feel for its seams and contours. Did your kid with the shiny Victrola get that?

That sense of estrangement—of being a step removed from the real thing—shows up whenever a powerful new tool arrives. The slide rule, starting in the 17th century, reduced the need for expertise at mental math; centuries later, the pocket calculator stirred unease among some engineers, who feared the fading of number sense. Such worries weren't groundless. Pressing "Cos" on a keypad got you a number, but the meaning behind it could slip away. Even in more rarefied precincts, the worry persisted. The MIT physicist Victor Weisskopf was troubled by his colleagues' growing reliance on computer simulations. "The computer understands the answer," he told them when they handed him their printouts, "but I don't think you understand the answer." It was the disquiet of an Egyptian king, digital edition, convinced that output was being mistaken for insight.

In what Zuboff called "the age of the smart machine," automation was mainly confined to the workplace—the mill, the industrial bakery, the cockpit. In the age of the PC and then the web, technology escaped into the home, becoming general purpose, woven into everyday life. By the 2000s, researchers were already asking what search engines were doing to us. You'd see headlines such as "This Is Your Brain on Google." Although the panic was overplayed, some effects were real. A widely cited study found that, in certain circumstances, people would remember *where* a fact could be found rather than the fact itself.

In truth, human cognition has always leaked beyond the skull—into instruments, symbols, and one another. (Think of the couples you know: One person remembers birthdays, the other where the passports live.) From the time of tally bones and to the era of clay tablets, we've been storing thought in the world for tens of millennia. Plenty of creatures use tools, but their know-how dies with them; ours accumulates as culture—a relay system for intelligence. We inherit it, extend it, and build upon it, so that each generation can climb higher than the last: moving from pressure-flaked blades to bone needles, to printing presses, to quantum computing. This compounding of insight—externalized, preserved, shared—is what sets *Homo sapiens* apart. Bonobos live in the ecological present. We live in history.

Adrienne LaFrance: The six main arcs in storytelling, as identified by an A.I.

Accumulation, meanwhile, has a critical consequence: It drives specialization. As knowledge expands, it no longer resides equally in every head. In small bands, anyone could track game, gather plants, and make fire. But as societies scaled up after the agrarian revolution, crafts and guilds proliferated—toolmakers who could forge an edge that held, masons who knew how to keep a vault from collapsing, glassblowers who refined closely guarded recipes and techniques. Skills once lodged in the body moved into tools and rose into institutions. Over time, the division of labor became, inevitably, a division of *cognitive* labor.

The philosopher Hilary Putnam once remarked that he could use the word *elm* even though he couldn't tell an elm from a beech. Reference is social: You can talk about elms because others in your language community—botanists, gardeners, foresters—can identify them. What's true of language is true of knowledge. Human capability resides not solely in individuals but in the networks they form, each of us depending on others to fill in what we can't supply ourselves. Scale turned social exchange into systemic interdependence.

The result is a world in which, in a classic example, nobody knows how to make a pencil. An individual would need the skills of foresters, saw millers, miners, chemists, lacquerers—an invisible network of crafts behind even the simplest object. Mark Twain, in *A Connecticut Yankee in King Arthur's Court*, imagined a 19th-century engineer dropped into Camelot dazzling his hosts with modern wonders. Readers went with it. But drop his 21st-century counterpart into the same setting, and he'd be helpless. Manufacture insulated wire? Mix a batch of dynamite? Build a telegraph from scratch? Most of us would be stymied once we failed to get onto the Wi-Fi.

The cognitive division of labor is now so advanced that two physicists may barely understand each other—one modeling dark matter, the other building quantum sensors. Scientific mastery now means knowing more and more about less and less. This concentration yields astonishing progress, but it also means grasping how limited our competence is: Specialists inherit conceptual tools they can use but can no longer make. Even mathematics, long romanticized as the realm of the solitary genius, now works like this. When Andrew Wiles proved Fermat's Last Theorem, he didn't re-derive every lemma himself; he assembled results that he trusted but didn't personally reproduce, building a structure he could see whole even if he hadn't cut each beam.

The widening of collaboration has changed what it means to know something. Knowledge, once imagined as a possession, has become a relation—a matter of how well we can locate, interpret, and synthesize what others know. We live inside a web of distributed intelligence, dependent on specialists, databases, and instruments to extend our reach. The scale tells the story: The *Nature* paper that announced the structure of DNA had two authors; a *Nature* paper in genomics today might have 40. The two papers announcing the Higgs boson? Thousands. Big science is big for a reason. It was only a matter of time before the network acquired a new participant—one that could not just store information but imitate understanding itself.

The old distinction between information and skill, between "knowing *that*" and "knowing *how*," has grown blurry in the era of large language models. In one sense, these models are static: a frozen matrix of weights you could download to your laptop. In another, they're dynamic; once running, they generate responses on the fly. They do what Socrates complained writing could not: They answer questions, adjust to an interlocutor, carry on a conversation. (Sometimes even with themselves; when they feed their own outputs back as inputs, AI researchers call it "reasoning.") It wasn't hard to imagine Google as an extension of memory; a large language model feels, to many, more like a stand-in for the mind itself. In harnessing new forms of artificial intelligence, is our own intelligence being amplified—or is it the artificial kind that, on little cat feet, is coming into its own?

We can't put the genie back in the bottle; we *can* decide what spells to have it cast. When people talk about de-skilling, they usually picture an individual who's lost a knack for something—the pilot whose hand-flying gets rusty, the doctor who misses tumors without an AI assist. But most modern work is collaborative, and the arrival of AI hasn't changed that. The issue isn't how humans compare to bots but how humans who use bots compare to those who don't.

Alex Reisner: AI is coming for YouTube creators

Some people fear that reliance on AI will make us worse in ways that will swamp its promised benefits. Whereas Dario Amodei, the CEO of Anthropic, sanguinely imagines a "country of geniuses," they foresee a country of idiots. It's an echo of the old debate over "risk compensation": Add seatbelts or antilock brakes, some social scientists argued a few decades ago, and people will simply drive more recklessly, their tech-boosted confidence leading them to spend the safety margin. Research eventually showed a more encouraging result: People do adjust, but only partially, so that substantial benefits remain.

Something similar has seemed to hold for the clinical use of AI, which has been common in hospitals for more than a decade. Think back to that colonoscopy study: After performing AI-assisted procedures, gastroenterologists saw their unaided rate of polyp detection drop by six percentage points. But when another study pooled data from 24,000 patients, a fuller picture emerged: AI assistance raised overall detection rates by roughly 20 percent. (The AI here was an expert system—a narrow, reliable form of machine learning, not the generative kind that powers chatbots.) Because higher detection rates mean fewer missed cancers, this "centaur" approach was plainly beneficial, regardless of whether individual clinicians became fractionally less sharp. If the collaboration is saving lives, gastroenterologists would be irresponsible to insist on flying solo out of pride.

In other domains, the more skillful the person, the more skillful the collaboration—or so some recent studies suggest. One of them found that humans outperformed bots when sorting images of two kinds of wrens and two kinds of woodpeckers. But when the task was spotting fake hotel reviews, the bots won. (Game recognizes game, I guess.) Then the researchers paired people with the bots, letting the humans make judgments informed by the machine's suggestions. The outcome depended on the task. Where human intuition was weak, as with the hotel reviews, people second-guessed the bot too much and dragged the results down. Where their intuitions were good, they seemed to work in concert with the machine, trusting their own judgment when they were sure of it and realizing when the system had caught something they'd missed. With the birds, the duo of human and bot beat either alone.

The same logic holds elsewhere: Once a machine enters the workflow, mastery may shift from production to appraisal. A 2024 study of coders using GitHub Copilot found that AI use seemed to redirect human skill rather than obviate it. Coders spent less time generating code and more time assessing it—checking for logic errors, catching edge cases, cleaning up the script. The skill migrated from composition to supervision.

That, more and more, is what “humans in the loop” has to mean. Expertise shifts from producing the first draft to editing it, from speed to judgment. Generative AI is a probabilistic system, not a deterministic one; it returns likelihoods, not truth. When the stakes are real, skilled human agents have to remain accountable for the call—noticing when the model has drifted from reality, and treating its output as a hypothesis to test, not an answer to obey. It’s an emergent skill, and a critical one. The future of expertise will depend not just on how good our tools are but on how well we think alongside them.

But collaboration presupposes competence. A centaur goes in circles if the human half doesn’t know what it’s doing. That’s where the panic over pedagogy comes in. You can’t become de-skilled if you were never skilled in the first place. And how do you inculcate basic competencies in an age when the world’s best homework machine snuggles into every student’s pocket?

Those of us who teach have a lot of homework of our own to do. Our old standbys need a rebuild; in the past couple of years, too many college kids have, in an unsettling phrase, ended up “majoring in ChatGPT.” Yet it’s too soon to pronounce confidently what the overall pedagogical effect of AI will be. Yes, AI can dull some edges. Used well, it can also sharpen them.

Consider a recent randomized trial in a large Harvard physics course. Half of the students learned two lessons in the traditional “best practice” mode: an active, hands-on class led by a skilled instructor. The other half used a custom-built AI tutor. Then they switched. In both rounds, the AI-tutored students came out ahead—by a lot. They didn’t just learn more. They worked faster, too, and reported feeling more motivated and engaged. The system had been designed to behave like a good coach: showing you how to break big problems into smaller ones, offering hints instead of blurting out answers, titrating feedback and adjusting to each student’s pace.

Charlie Warzel: AI is a mass-delusion event

That’s what made the old-style tutorial system powerful: attention. I remember my first weeks at Cambridge University, sitting one-on-one with my biochemistry tutor. When I said, “I sort of get it,” he pressed until we were both sure that I did. That targeted focus was the essence of a Cambridge supervision. If custom-fitted in the right way, large language models promise to mass-produce that kind of attention—not the cardigan, not the burnished briar, not the pensive moue, but the steady, responsive pressure that turns confusion into competence.

Machines won’t replace mentors. What they promise to do is handle the routine parts of tutoring—checking algebra, drilling lemmas, reminding students to write the units, and making sure they grasp how membrane channels work. This, in theory, can free the teacher to focus on other things that matter: explaining the big ideas, pushing for elegance, talking about careers, noticing when a student is burning out.

That’s the upbeat scenario, anyway. We should be cautious about generalizing from one study. (A study of Turkish high-school students found no real gains from the use of a tutor bot.) And we should be mindful that those physics students put their tutor bot to good use because they had in-class exams to face—a proctor, a stopwatch, a grader’s cold eye.

We should also be mindful that what works for STEM courses may not work for the humanities. The term paper, for all its tedium, teaches a discipline that's hard to reproduce in conversation: building an argument step by step, weighing evidence, organizing material, honing a voice. Some of us who teach undergrads have started telling ambitious students that if they write a paper, we'll read and discuss it with them, but it won't count toward their grade. That's a salve, not a solution. In a curious cultural rewind, orality may have to carry more of the load. Will Socrates, dialogue's great defender, have the last word after all?

Erosive de-skilling remains a prospect that can't be wished away: the steady atrophy of basic cognitive or perceptual capacities through overreliance on tools, with no compensating gain. Such deficits can deplete a system's reserves—abilities you seldom need but must have when things go wrong. Without them, resilience falters and fragility creeps in. Think of the airline pilot who spends thousands of hours supervising the autopilot but freezes when the system does. Some automation theorists distinguish between "humans in the loop," who stay actively engaged, and "humans *on* the loop," who merely sign off after a machine has done the work. The second, poorly managed, produces what the industrial psychologist Lisanne Bainbridge long ago warned of: role confusion, diminished awareness, fading readiness. Like a lifeguard who spends most days watching capable swimmers in calm water, such human supervisors rarely need to act—but when they do, they must act fast, and deftly.

The same dynamic shadows office work of every kind. When lawyers, project managers, and analysts spend months approving what the system has already drafted or inferred, they become "on the loop," and out of practice. It's the paradox of partial automation—the better the system performs, the less people have to stay sharp, and the less prepared they are for the rare moments when performance fails. The remedy probably lies in institutional design. For example, a workplace could stage regular drills—akin to a pilot's recurrent flight-simulator training—in which people must challenge the machine and ensure that their capacities for genuine judgment haven't decayed in the long stretches of smooth flight.

Reserve skills, in many cases, don't need to be universal; they just need to exist somewhere in the system, such as those elm experts. That's why the Naval Academy, alarmed by the prospect of GPS jamming, brought back basic celestial-navigation training after years of neglect. Most sailors will never touch a sextant on the high seas, but if a few of them acquire proficiency, they may be enough to steady a fleet if the satellites go dark. The goal is to ensure that at least some embodied competence survives, so that when a system stumbles, the human can still stand—or at least stay afloat.

The most troubling prospect of all is what might be called *constitutive* de-skilling: the erosion of the capacities that make us human in the first place. Judgment, imagination, empathy, the feel for meaning and proportion—these aren't backups; they're daily practices. If, in Jean-Paul Sartre's fearful formulation, we were to become "the machine's machine," the loss would show up in the texture of ordinary life. What might vanish is the tacit, embodied knowledge that underwrites our everyday discernment. If people were to learn to frame questions the way the system prefers them, to choose from its menu of plausible replies, the damage wouldn't take the form of spectacular failures of judgment so much as a gradual attenuation of our character: shallower conversation, a reduced appetite for ambiguity, a drift toward automatic phrasing

where once we would have searched for the right word, the quiet substitution of fluency for understanding. To offload those faculties would be, in effect, to offload ourselves. Losing them wouldn't simply change how we work; it would change who we are.

Most forms of de-skilling, if you take the long view, are benign. Some skills became obsolete because the infrastructure that sustained them also had. Telegraphy required fluency in dots and dashes; linotype, a deft hand at a molten-metal keyboard; flatbed film editing, the touch of a grease pencil and splicing tape, plus a mental map of where scenes lived across reels and soundtracks. When the telegraph lines, hot-metal presses, and celluloid reels disappeared, so did the crafts they supported.

Another kind of de-skilling represents the elimination of drudgery. Few of us mourn the loss of hand-scrubbing laundry, or grinding through long division on paper. A neuroscientist I know swears by LLMs for speeding the boilerplate-heavy business of drafting grant proposals. He's still responsible for the content, but if his grant-writing chops decline, he's unbothered. That's not science, in his view; it's a performance demanded by the research economy. Offloading some of it gives him back time for discovery.

Alex Reisner: The end of publishing as we know it

Occupational de-skilling can, in fact, be democratizing, widening the circle of who gets to do a job. For scientists who struggle with English, chatbots can smooth the drafting of institutional-review-board statements, clearing a linguistic hurdle that has little to do with the quality of their research. De-skilling here broadens access. Or think of Sennett's bakery and the Greek men who used to staff the kitchen floor. The ovens burned their arms, the old-fashioned dough beaters pulled their muscles, and heavy trays of loaves strained their back. By the '90s, when the system ran on a Windows controller, the workforce looked different: A multiethnic mix of men and women stood at the screens, tapping icons. The craft had shrunk; the eligible workforce had grown. (And yes, their labor had grown cheaper: a wider gate, a lower wage.)

We often lose skills simply because tech lets us put our time to better use and develop skills further up the proverbial value chain. At one of Zuboff's pulp mills, operators who were freed from manual activity could spend more time anticipating and forestalling problems. "Sitting in this room and just thinking has become part of my job," one said. Zuboff called this *reskilling*: action skills giving way to abstraction and procedural reasoning, or what she termed "intellective skills." Something similar happened with accountants after the arrival of spreadsheet programs such as VisiCalc; no longer tasked with totting up columns of numbers, they could spend more time on tax strategy and risk analysis.

More radical, new technologies can summon new skills into being. Before the microscope, there were naturalists but no microscopists: Robert Hooke and Antonie van Leeuwenhoek had to invent the practice of seeing and interpreting the invisible. Filmmaking didn't merely borrow from theater; it brought forth cinematographers and editors whose crafts had no real precedent. Each leap enlarged the field of the possible. The same may prove true now. Working with large language models, my younger colleagues insist, is already teaching a new kind of craftsmanship—prompting, probing, catching bias and hallucination, and, yes, learning to think

in tandem with the machine. These are emergent skills, born of entanglement with a digital architecture that isn't going anywhere. Important technologies, by their nature, will usher forth crafts and callings we don't yet have names for.

The hard part is deciding, without nostalgia and inertia, which skills are keepers and which are castoffs. None of us likes to see hard-won abilities discarded as obsolete, which is why we have to resist the tug of sentimentality. Every advance has cost something. Literacy dulled feats of memory but created new powers of analysis. Calculators did a number on mental arithmetic; they also enabled more people to "do the math." Recorded sound weakened everyday musical competence but changed how we listen. And today? Surely we have some say in whether LLMs expand our minds or shrink them.

Throughout human history, our capabilities have never stayed put. Know-how has always flowed outward—from hand to tool to system. Individual acumen has diffused into collective, coordinated intelligence, propelled by our age-old habit of externalizing thought: stowing memory in marks, logic in machines, judgment in institutions, and, lately, prediction in algorithms. The specialization that once produced guilds now produces research consortia; what once passed among masters and apprentices now circulates through networks and digital matrices. Generative AI—a statistical condensation of human knowledge—is simply the latest chapter in our long apprenticeship to our own inventions.

The most pressing question, then, is how to keep our agency intact: how to remain the authors of the systems that are now poised to take on so much of our thinking. Each generation has had to learn how to work with its newly acquired cognitive prostheses, whether stylus, scroll, or smartphone. What's new is the speed and intimacy of the exchange: tools that learn from us as we learn from them. Stewardship now means ensuring that the capacities in which our humanity resides—judgment, imagination, understanding—stay alive in us. If there's one skill we can't afford to lose, it's the skill of knowing which of them matter.

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