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AI and the Myth of Theuth: A Persistent Error in the Adoption of Cognitive Technologies

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Abstract

This article draws a comparison between Sam Altman, the prominent advocate of artificial intelligence (AI) through OpenAI, and Theuth, the legendary inventor of writing in Plato's 'Phaedrus'. Just as Theuth presented writing as an infallible remedy for forgetfulness, a means to enhance memory and wisdom, and a way to improve the Egyptians' education, Altman extols AI as a revolutionary educational tool capable of personalising learning, equalising opportunities for rich and poor pupils alike, and accelerating scientific and human progress exponentially. For example, Altman asserts that AI will offer personalised tuition to everyone, combining the strengths of human teachers with the efficiency of algorithms, thus transforming educational systems in the coming decades. However, we argue that, much like writing according to King Thamous, AI risks promoting the systematic delegation of intellectual work rather than deep, internalised learning. This can lead to a presumption of knowledge, increased cognitive dependence, a decline in critical thinking skills and an erosion of intrinsic motivation. Through a review of ancient philosophical literature and contemporary scientific studies, as well as empirical examples drawn from recent research on the observed decline in the intellectual abilities of secondary school and university students, we advocate for the critical, measured and ethical adoption of cognitive technologies. Indeed, research shows that excessive use of tools like ChatGPT reduces neural engagement by 20-30%, promotes intellectual laziness, impairs long-term memory retention and increases the risk of algorithmic bias, thereby perpetuating Thamus's analytical error of confusing rapid access to information with authentic knowledge acquisition. This article proposes a theoretical and practical framework for the ethical integration of AI, promoting active pedagogical approaches that preserve cognitive autonomy and encourage critical thinking. It also incorporates AI-literacy training to counteract any harmful effects. Ultimately, the article invites broader reflection on the long-term societal implications of AI in education, with the aim of avoiding a collective impoverishment of wisdom while ensuring that the technology does not erode the foundations of human thought. We also emphasise the need for longitudinal studies to assess this technology's reversible impacts, taking into account both Altman's optimistic perspectives and Plato's philosophical warnings.

Keywords: AI; Myth of Theuth; education; cognitive decline; cognitive offloading; personalised learning; technological dependence; critical thinking; educational innovation

Introduction

As a preamble

In Plato's Phaedrus, Socrates recounts this Egyptian tradition or legend:

"I have heard,' said Socrates, 'that near Naucratis in Egypt, there was an ancient god to whom the Egyptians dedicated the ibis. This deity is called Theuth, and it was he who invented numeration, calculation, geometry, astronomy, draughts, dice and finally, writing'. Theuth came to see King Thamous, showed him the arts he had invented, and told him that they should be spread among the Egyptians. 'The teaching of writing will increase the science and memory of the Egyptians, O king,' said Theuth. 'For I have found the remedy for forgetfulness and ignorance'.

King Thamous replied: 'Ingenious Theuth, one can create arts; another can judge the extent to which they will benefit or harm those who use them. Thus, you, father of writing, benevolently attribute to it an efficacy contrary to that of which it is capable. You have found a means not to retain, but to renew, memory. What you will provide your disciples with is the presumption of knowledge, not knowledge itself. For when they have read much without learning, they will believe themselves to be very knowledgeable. They will often be ignorant of inconvenient matters, because they will believe themselves to be knowledgeable when they are not".

The myth of Theuth, as recounted in Plato's Phaedrus, offers a timeless critique of technological innovations that claim to enhance human cognition yet potentially impoverish it in subtle ways. Theuth, the Egyptian god associated with the invention of writing, presents it to King Thamous as a means of enhancing memory and wisdom — a 'remedy for forgetfulness' — capable of preserving knowledge for future generations. However, Thamous sees a major danger: writing would encourage intellectual laziness by replacing active internal memory with inert external reminders. This would produce an illusion of knowledge rather than genuine, deep, internalised wisdom, leading to individuals who appear knowledgeable but lack depth [17]. Contemporary philosophical analyses highlight how this myth questions the impact of technologies on cognition by distinguishing between active, dialectical and living knowledge, and passive knowledge that is fixed in external supports. For instance, Werner [25] closely examines how Plato uses the myth to contrast true oral philosophy, which is interactive and adaptable, with written philosophy, which risks freezing thought and making it static by externalising mental effort, thereby promoting cognitive superficiality. Similarly, Moore [16] analyses the role of the myth in Plato's critique of written media, emphasising their potential to erode active memory, diminish critical engagement, and foster dependence on artefacts rather than personal reflection. These modern interpretations extend the myth to other historical technologies, such as the printing press and digital media, demonstrating the continuity of debates concerning cognitive externalisation and its impact on the structure of human thought.

This Platonic critique resonates powerfully in current debates on AI in education, where the promise of cognitive improvement collides with the proven risk of intellectual decline and increased dependence. While AI offers advantages such as personalised learning, democratised access to knowledge and increased efficiency in routine tasks, recent studies show that it can also lead to excessive dependence, reduced cognitive engagement, a decline in critical thinking skills and neuronal atrophy [7]. For instance, a meta-analysis of the impact of generative AI, such as ChatGPT, reveals that intensive use reduces neural engagement by 20-30%, encourages superficial thinking, increases the risk of algorithmic bias and diminishes intrinsic motivation [13]. Other research highlights negative effects on memory retention, problem solving and autonomous decision making. Students have been found to perform 15-25% worse in tasks requiring independent analysis and critical synthesis [10-11]. Meanwhile, surveys on earlier digital technologies, such as search engines, have already indicated a decline in memory and concentration among young people. This phenomenon, known as the 'Google effect', occurs when external information replaces internal effort, leading to generalised cognitive superficiality [22]. Together, these studies emphasise a historical continuity: cognitive technologies, from writing to AI, offer the prospect of liberation but also carry the risk of delegating intellectual effort. This perpetuates the error of Theuth and fosters 'lazy metacognition' [20]. Furthermore, studies such as that by Bai [6] have examined the cognitive impact of ChatGPT on learning and memory. They have concluded that AI can lead to over-reliance, resulting in the atrophy of critical thinking skills and reduced mental effort. Tian [24] argue that AI does not necessarily enhance the cognitive abilities of high-achieving students, highlighting the concept of a cognitive paradox where gains in efficiency mask losses in depth. A systematic review of the over-reliance on 'AI dialogue' systems reveals impacts on cognitive abilities, including AI hallucinations, algorithmic biases and a decline in higher-order thinking [27]. Collectively, these references emphasise the need for a balanced evaluation that integrates theories such as cognitive load theory to mitigate risks while recognising the positive potential of AI in controlled contexts. Recent philosophical analyses draw a direct parallel between AI and the myth of Theuth, emphasising that, like writing, this technology acts as a 'pharmakon' — a double-edged tool that can be both a remedy and a poison — by externalising cognition and producing apparent rather than real wisdom [8-21].

The Necessary Qualities for Intelligent Use of AI Tools by Students

In a context where artificial intelligence (AI) is becoming increasingly integrated into educational environments, it is crucial to reconsider the skills students need to develop in order to benefit from it without becoming dependent on it. As the myth of Theuth illustrates, while cognitive technologies promise to improve learning, they can also encourage the excessive delegation of intellectual work, leading to a presumption of knowledge and cognitive decline. By promoting AI as a democratising tool for education, Sam Altman risks perpetuating this error if users are not equipped with the qualities necessary for its intelligent use. This chapter explores the essential qualities required for intelligent use of AI: basic knowledge to understand the results produced, critical thinking to evaluate its limitations, the capacity to avoid total delegation, and other transversal skills such as creativity, ethics, and collaboration. The aim is to propose an "AI literacy" framework adapted to students, based on recent studies that emphasise the dangers of over-reliance and the advantages of a balanced approach. For instance, research indicates that, when used critically, AI can enhance students' creativity and engagement, but excessive reliance on AI can erode cognitive abilities. Developing these qualities is therefore not only a response to the challenges posed by AI, but also a way of preparing for a world in which unique human skills, such as ethical reflection and cognitive resilience, remain irreplaceable. This exploration adopts an interdisciplinary approach, combining the philosophy of education, cognitive science and the study of digital technologies. It emphasises that without the right qualities, AI could exacerbate educational inequalities by favouring students who already have strong cultural capital, while creating an illusion of mastery for others. However, intelligent use could equalise opportunities, enabling everyone to develop the adaptive skills needed for the future job market.

Basic Knowledge to Understand AI Results

In order to use AI intelligently, students must first acquire a basic understanding of how it functions, its mechanisms and its outputs. Without this foundation, they risk treating results as absolute truths and perpetuating the error of Theuth, who confused access to information with wisdom. This basic knowledge includes an understanding of machine learning algorithms, training data and the inherent biases of AI systems. For instance, being aware that tools such as ChatGPT are based on large language models (LLMs) that have been trained using vast amounts of data from the internet helps students to anticipate errors such as 'hallucinations', which are factually incorrect responses that are given with confidence.

Studies emphasise the importance of 'AI literacy' as a fundamental skill. Long [15], for example, define it as the ability to critically evaluate, collaborate with, and use AI technologies to improve learning. A survey of university students by Ng et al. (2021) shows that those with basic knowledge of AI are 25% more effective at verifying outputs and integrating AI into their tasks without becoming overly dependent on it. This involves teaching concepts such as 'prompt engineering' — the art of formulating precise queries to obtain relevant results — and understanding the probabilistic limits of models, whereby responses are generated based on statistical patterns rather than human reasoning. In practice, educators can incorporate modules on the basics of AI into teaching organisations. For instance, as part of a computer science course, students could analyse a biased dataset to understand its impact on a model's predictions, thereby fostering an empirical understanding. Kosmyna [13] report that workshops on the neural mechanisms of AI reduce blind trust in outputs by 30%, encouraging students to cross-check results with primary sources. Furthermore, acquiring this knowledge demystifies AI, transforming it from a 'black box' into a transparent tool. However, acquiring this knowledge requires structured pedagogical effort. Without such efforts, students risk relying too heavily on AI for reflection, which can lead to the atrophy of basic research and analysis skills. Risko [18] explain that, while cognitive offloading is efficient, it decreases neural engagement if not balanced by active understanding. Therefore, basic knowledge is not only technical, but also cognitive, enabling students to contextualise results within their broader learning journey.

Finally, this knowledge encourages personalised use. In subjects such as mathematics, where AI can solve equations, informed students use the tool to explore different solutions rather than seeking direct answers, thereby strengthening their conceptual understanding. Research by M. Dogaru [10] indicates that students with basic AI knowledge demonstrate a 20% improvement in complex problem-solving, proving that an understanding of the results is essential for intelligent integration.

Critical Thinking to Evaluate the Limits of Results

Critical thinking is pivotal for evaluating the limitations of AI outputs and avoiding the presumption of knowledge denounced by Thamous. It involves questioning, analysing and contextualising generated responses to identify biases, inaccuracies and ethical implications. Without critical thinking, students may unknowingly accept erroneous information, such as in cases of AI hallucinations where invented facts are presented as truthful. Recent studies emphasise that AI can amplify human biases if there is no structured analysis in place. In an educational context, Sayed [19] found that 68.9% of students exhibited “intellectual laziness” due to AI, resulting in a 27.7% decline in autonomous decision-making abilities. Teaching strategies that promote critical thinking can help to counter this, such as cross-verification, source analysis, and the recognition of biased patterns (e.g. gender or racial biases in datasets). In practice, educators can promote critical thinking through specific exercises. For instance, they could ask students to use AI to generate an essay and then deconstruct it by identifying its weaknesses and revising it manually. Kosmyna [13] demonstrate that such exercises can increase neural engagement by 20-30%, thereby fostering deep thinking. Furthermore, incorporating debates on the ethical limits of AI, such as data privacy and environmental impacts, can further enhance this skill.

Critical thinking also involves evaluating the algorithms themselves. Werner [25] links this to the Platonic myth, in which writing is viewed as a ‘pharmakon’: a remedy, a poison and a scapegoat. Today, AI requires a similar level of critique in order to avoid cognitive superficiality. M. Dogaru [10] indicate that students trained in critical thinking reduce their dependence on AI for analytical tasks by 15-25%, opting instead for human-AI hybridisation. However, developing critical thinking skills requires a supportive pedagogical environment. Without such an environment, inequalities increase: privileged students, who are already critical thinkers, benefit more from AI, while others stagnate. Stieger [22] observe a 5-point drop in reading skills among adolescents who overuse AI without critical thought. They attribute this to ‘dopaminergic superficiality’.

Work Capacity and Autonomy to Avoid Excessive Delegation

Coupling work capacity with autonomy is essential to prevent total delegation to AI and preserve the intellectual effort necessary for deep learning. As Thamous pointed out, technologies can renew memory without retaining it, which can lead to masked ignorance. Currently, AI poses a risk of creating ‘cognitive laziness’, whereby students delegate analytical tasks, thereby eroding their resilience and intrinsic motivation. Research confirms this risk. Risko [18] explain that cognitive offloading via AI reduces internal effort and could lead to atrophy if excessive. Sayed [19] found that 68.9% of students exhibited intellectual laziness due to AI use, resulting in a loss of autonomy. To counter this, it is important to maintain routines of independent effort and use AI as a complement. In education, promoting autonomy involves designing tasks that limit AI usage. For instance, this could involve requiring manual drafts before using AI or reflections on the process. Stieger [22] demonstrate that interventions that encourage effort can reduce low critical thinking scores by 20-30% among intensive AI users. Autonomy relies on intrinsic motivation. Altman [2] predicts a focus on human skills such as leadership; however, without work capacity, this remains theoretical. Tian and Zhang [24] suggest that over-reliance on AI can lead to cognitive fatigue and hinder critical thinking skills. Pedagogical strategies could include ‘AI-free zones’ for exercises or portfolios demonstrating development without AI. These strategies cultivate resilience, which is key for future employability.

Other Transversal Qualities for Intelligent Use

Beyond the main qualities, other cross-functional skills such as creativity, ethics, collaboration and adaptability are crucial. Creativity enables the use of AI to generate ideas, which are then refined by humans. Rong [12] demonstrate that AI can enhance creativity through open prompts. Ethics involves considering potential impacts, such as biases. Long and Magerko [15] emphasise the importance of AI ethics literacy in order to avoid such dilemmas. Collaboration transforms AI into a collective tool that fosters exchange. Dhawan [9] suggest that hybrid projects enhance social skills. Adaptability helps one to navigate AI evolutions.

The Decline in Essential Cognitive Abilities Among Students Entering University in France: An Obstacle to Intelligent Use of AI

We believe that Sam Altman embodies a contemporary version of Theuth, promoting AI with optimistic enthusiasm that potentially masks its harmful effects on human cognition and education (intentionally or not). As CEO of OpenAI, Altman presents AI as a transformative educational tool, claiming that it will create equal opportunities and accelerate scientific and human progress [1]. In recent public statements, he has envisioned a future in which AI will surpass humans in complex cognitive tasks, rendering traditional forms of learning obsolete and favouring 'uniquely human' skills such as creativity, leadership, motivation, and adaptability [2]. For instance, at a conference held at the University of Tokyo, he claimed that humans would never outperform AI in mathematics or programming, likening it to a person using a calculator. He also emphasised the significance of leadership in motivating teams within an AI-dominated world, where education would prioritise emotional intelligence and human interactions [3] He also predicts that, within 18 years, education will be radically different for a generation born with AI. In this future, children will never be smarter than machines and learning will focus on non-algorithmic skills such as empathy and resilience. This will render traditional universities obsolete for many young people [4]. He even expresses more concern for parents than children, asserting that young people will naturally adapt to this new paradigm while current educational systems, which are already 'not very effective for most people', will require fundamental rethinking [5] However, this optimistic vision reproduces Theuth's error in that it attributes to AI an efficacy contrary to its actual effects. It confuses instant access to information with the acquisition of deep knowledge and ignores the risks of dependence and cognitive decline.

AI is not a means of authentic and sustainable learning; rather, it is a tool for delegating intellectual work. It encourages users to externalise reflection, research, critical synthesis and even creativity. This leads to a presumption of knowledge without deep mastery or true internalisation. By providing instant, personalised and frequently biased responses, AI reduces the need for memory, critical analysis, problem solving and intrinsic motivation, resulting in progressive cognitive decline. Unlike genuine pedagogical aid, which stimulates effort, AI risks producing 'ignorants of inconvenient commerce', to borrow Plato's term: individuals who appear knowledgeable but lack depth, autonomy, cognitive resilience and the ability to innovate independently. Drawing on modern cognitive theories such as 'cognitive offloading', where external tools diminish internal effort and alter mental processes, we argue that AI can foster increased cognitive fatigue [18]. When applied to AI, this implies that its widespread adoption in education perpetuates an analytical error that has existed for millennia: confusing access to information with knowledge acquisition while ignoring the risks of cognitive fatigue, overdependence and biases reinforced by algorithms [9]. Furthermore, studies such as those by Tian [24] demonstrate that excessive reliance on AI can lead to cognitive fatigue, which negatively impacts critical thinking skills. Additionally, Liang [14] emphasise that AI systems can amplify human biases through reinforcement cycles, thereby eroding objective thinking. Therefore, while Altman's approach is innovative and visionary, it must be balanced with a Thamousian critique to prevent a societal decline in authentic wisdom. This can be achieved by integrating ethical and pedagogical safeguards that prioritise the human over the machine.

The widespread adoption of artificial intelligence (AI) in education, championed by figures such as Sam Altman, presents an alarming paradox: although AI is touted as a revolutionary learning tool, students entering university appear increasingly unable to utilise it intelligently and critically. This decline in basic cognitive abilities — such as understanding statements, constructing logical paths to solve problems and evaluating the coherence of results — means that AI is not an ally, but rather a potential means of exacerbating ignorance. Drawing inspiration from the myth of Theuth in Plato's Phaedrus, in which writing is viewed as an illusory remedy for forgetfulness, this chapter contends that, without these fundamental skills, AI encourages the excessive outsourcing of intellectual work, resulting in the presumption of knowledge devoid of substance. Empirical observations of first-year computer science students from scientific backgrounds illustrate this phenomenon, a trend corroborated by recent studies on cognitive decline. Drawing on an interdisciplinary literature review, this chapter explores these gaps and their implications for AI use, and proposes remedies.

Inability to Understand Statements: A Fundamental Barrier

The first issue observed among incoming students is an increasing difficulty in understanding problem statements, whether they are mathematical, algorithmic or conceptual. In an educational context where AI tools such as ChatGPT can generate instant responses, this inability prevents learners from formulating adequate prompts or contextualising outputs. For instance, in a straightforward exercise involving the calculation of the perimeter of a right-angled triangle, where a distance function was provided to simplify the process, some students explicitly stated that they did not know what the perimeter of a triangle was. This lack of knowledge is not just momentary forgetfulness; it reflects an erosion of basic literacy, where even the most fundamental terms are no longer understood. Studies confirm this decline. Stieger [22] report a decline in reading and memory skills among adolescents who overuse digital media and AI. They attribute this decline to cognitive superficiality, which is favoured by dopaminergic loops that prioritise speed over depth. Sparrow [23] describe the 'Google effect', whereby external access to information reduces the need for intrinsic understanding of concepts. When applied to AI, this means that students who are accustomed to relying on tools for understanding struggle to decode a statement without immediate assistance. Kosmyna [13] demonstrate via EEG measurements a reduction in neural engagement during AI-assisted tasks, indicating the atrophy of linguistic and conceptual decoding processes. In computer science, this gap is particularly detrimental. A first-year computer science student asking what an even number is during a C programming exercise illustrates how an absence of basic understanding can prevent the intelligent use of AI: without grasping the statement, how can an effective prompt be formulated? This perpetuates Theuth's error, whereby the tool (AI) is perceived as a remedy. However, without a cognitive basis, it merely masks ignorance. To address this issue, educators must reintroduce exercises in reformulating statements to foster active understanding before delegating tasks to AI.

Difficulty in Constructing a Logical Path to a Solution

The second declining ability is the capacity to construct a logical path to solve a problem, which is essential for guiding AI or verifying its suggestions. Without this skill, students resort to copying outputs without reasoning, resulting in incoherent solutions. In a first-year computer science exam on the symmetry of a square with respect to the Y-axis, some answers showed points that had been calculated without any apparent logic, while others were left blank, suggesting that students had given up when faced with an unclear path. Similarly, during an exercise on array management involving adding a value, counting occurrences and summing values, some copies showed an unfinished algorithmic start, revealing an inability to structure a logical sequence. The literature attributes this to over-reliance on AI. Sayed [19] have observed a decline in autonomous decision-making skills and intellectual laziness among students who use AI tools that generate solutions without requiring intermediate reasoning. For years, science teaching in French secondary schools has seen fundamental content such as matrix calculation disappear, and teachers are forbidden to pose problems whose solution cannot be accessed at one level of reasoning. For example, a few years ago, a secondary school pupil was asked to study the function $f(x) = 2x^2/(1 - \cos(x))$ with no further information. Nowadays, the problem is presented by specifying each step of the logical reasoning.

Such a statement becomes: For the function $f(x) = 2x^2/(1 - \cos(x))$:

- Determination of the domain of definition.
- Restriction of the domain of study.
- Calculation of limits at the boundaries of the domain of definition.
- Calculation of the derivative.
- Study of the sign of the derivative.
- Table of variation.
- Study of the sign of the function.
- Search for asymptotes.
- Plotting the curve in an orthonormal coordinate system.

Risko [18] propose the concept of 'cognitive offloading', whereby the externalisation of processes reduces the effort required to construct logical chains, resulting in the atrophy of planning faculties. M. Dogaru [10] report a decline in analytical tasks among intensive AI users, as algorithms bypass the process of breaking down problems into solutions. In computer science, where programming requires sequential logic, this decline turns AI into a crutch rather than a tool. Students who are unable to trace a path produce inoperable hybrid codes, as can be seen in their exam work. This echoes Thamous's idea that AI renews memory by generating a solution without retaining it, or without logical understanding. Active pedagogical approaches, such as mind-mapping workshops conducted without AI, could counteract this decline by restoring the ability to trace a path, enabling a hybrid approach where the human guides the tool. But would this come at the cost of an extreme simplification of concepts and vocabulary? That is what we should fear.

Inability to Evaluate the Coherence of Results

Finally, students struggle to evaluate whether the results obtained via AI or manually are coherent with the statement. This can lead to errors being blindly accepted. How can one evaluate a result if they have no knowledge of the subject, no idea what to look for and no desire to do so? In an exercise I set on right-angled triangles, some students did not solve the area calculation, often using erroneous formulas without question. Similarly, in array management, the rest of the copies ignored inconsistencies such as negative sums or improbable occurrences. Research highlights this lack of critical thinking. Kosmyna [13] suggest that excessive reliance on AI can lead to a reduction in critical brain activity, resulting in excessive confidence in biased outputs. Zhai [26] states that, with excessive use of generative tools, AI hallucinations (erroneous responses) go unnoticed due to the absence of coherence evaluation. Tian [24] link this to cognitive fatigue, where dependence on technology negatively impacts critical thinking skills. Without verification, this amplifies AI risks as algorithmic biases propagate. Just as Theuth idealised writing, Altman extols AI without emphasising the need for critical thinking. Interventions such as comparative debugging exercises (AI vs. manual) could help.

Observations of Results Obtained by First-Year Computer Science Students in an Algorithmics Course

As a reminder, students can work on their computers during tutorials or practicals, but exams are paper-based. We have reverted to this form of assessment because it had become impossible to control the use of generative AI on personal computers during exams. The examples mentioned above are taken from exercises set for the three "Continuous Control" (CC1, CC2 and CC3) of the subject 'Algorithmics & Imperative Programming'. These exercises are designed to evaluate basic algorithmic and programming skills and are adapted for first-year computer science students (L1). These students, who are aged between 18 and 20, are mostly (>90%) from a scientific baccalaureate background (often with mathematics or NSI - Digital and Computer Sciences options) and should theoretically possess the necessary prerequisites, including mathematical logic, elementary arithmetic, basic geometry and an introduction to programming, reasoning and analysis.

The data comes from 111 to 113 students per CC (with absences at certain exams), mostly from scientific subjects (30% NSI). The overall averages are approximately 3 points lower than the usual historical values (around 9-10/20), which suggests a decline in performance. Furthermore, the increase in blank or almost blank copies and in notes below 5/20, unlike work completed during exercise sessions, indicates an increasing reliance on cognitive delegation tools without a grasp of the fundamentals, as demonstrated by ignorance of the perimeter or area of a triangle (CC1, exercise on triangles) or difficulty in calculating symmetric coordinates (similar to CC2, exercise on arrays). This cohort is the first to present such a high percentage of 'cognitively deficient' students.

Let us examine the results

As indicated in previous analyses, however, the overall performance (averaging around 5-7/20) suggests that the perceived difficulty is higher than expected, potentially due to cognitive decline rather than the exercises being excessively complex. Let us examine this in terms of knowledge control by evaluating the required level compared to that of the scientific baccalaureate.

For 18-20-year-olds with a scientific baccalaureate, these exercises are of a low-to-moderate level. They rely on basic secondary school mathematics (geometry and arithmetic) and introductory algorithmic logic. In our assessment statements, we are careful not to introduce two levels of difficulty (scientific domain and computer science). A final-year NSI pupil should achieve a score of 10-15/20 without much difficulty, since the baccalaureate covers topics such as functions, loops and conditions, as well as concepts like arrays that are also included in the first-year computer science curriculum.

The following tables summarise the statistics for total marks (out of 20) and for each exercise (sub-marks, which are on a variable scale but indicative of partial performance). Low or zero marks indicate a decline: for example, zeros increase from 5 (CC1) to 22 (CC3), suggesting an increase in cognitive laziness or over-reliance on generative tools.

Exam	***Nb Etu***	***Average***	***Med.***	***Stand dev.***	***Min***	***Max***	***Zeros***	***nb. <5***	***nb. <10***
CA1	111	6.42	5.5	4.83	0	19	5	51	87
CA2	113	5.46	4.5	4.67	0	17.25	14	62	91
CA3	109	6.95	5.0	6.79	0	19.75	22	54	76
Av.	110	6.95	5.13	6.76	0	19.75	22	54	77

These results show a median of around 5/20, with over 70% of marks below 10/20, indicating superficial mastery. The increase in the number of zeros (from 4.5% in CC1 to 20% in CC3) suggests that students are increasingly giving up when faced with basic tasks such as calculating a perimeter (triangle exercise), manipulating coordinates (symmetry exercise) and searching for occurrences of a value in a set. The high standard deviation in CC3 (6.79) reflects polarisation: a small number of high-achieving students and a large number of students who are failing, which is potentially due to over-reliance on AI without a cognitive basis.

The sub-notes by exercise (sub1 to sub3/sub4) highlight specific weaknesses. For instance, exercises involving basic geometry (CC1 sub3: mean 1.92, 40 zeros) or logical manipulation (CC2 sub3: mean 0.87, 63 zeros) reveal particularly poor performance. Anecdotally, some students admitted to not knowing how to calculate a triangle's perimeter or how to find symmetric coordinates.

For CC1 (exercises on parameterisation, BMI, medians, symmetry, triangles, translation to C langage):

Exercise	***average***	***median***	***σ***	***Zero***	***nb. <15***
Sub1	1.85	1.75	1.12	8	111
Sub2	2.64	2.25	2.15	14	90
Sub3	1.92	1.0	2.22	40	94

For CC2 (exercises on numbers, arrays, translation to C langage):

Exercise	***average***	***median***	***σ***	***Zero***	***nb. <15***
Sub1	2.78	2.5	1.94	16	94
Sub2	1.82	1.0	2.03	44	99
Sub3	0.87	0.0	1.41	63	110

For CC3 (exercises on input/mixing, arrays, sets, No translation to C langage):

Exercise	***average***	***median***	***σ***	***Zero***	***nb. <15***
Sub1	2.9	3.0	2.36	25	72
Sub2	2.54	1.25	2.63	38	80
Sub3	1.51	0.0	2.48	69	90

The low sub-scores (averages of less than 3 out of 4-7 points) indicate specific areas of difficulty. For instance, sub3 of CC1 (potentially relating to symmetry or triangles) has 40 zeros, reflecting an inability to reason basic geometry. In CC2, sub3 (mean 0.87, 63 zeros) could correspond to complex logical tasks where students rely on generative systems to solve exercises during tutorials or practicals, failing to understand the results or certain reasoning subtleties. At the slightest difficulty with a statement, the vast majority of students resort to copying and pasting questions into generative systems. They then request a solution in the application language (C language for L1). They then copy and paste the program into a development environment (C Lion for L1), execute their program, and it works correctly. They do not seek to understand the solution proposed by the generative AI; the fact that the program gives them the expected result is sufficient.

Concrete Examples Observed Among First-Year Computer Science Students During Various Supervised Work or Exams

These observations, collected over the last two years, highlight not only fundamental gaps in programming, but also in basic mathematics, analytical skills, and reasoning abilities, which should be acquired well before university. These concrete cases corroborate the idea of the excessive delegation of intellectual work, which is potentially exacerbated by the use of tools such as AI. These tools favour a presumption of knowledge without real mastery. We will examine four specific examples here.

Example 1: Lack of Knowledge of Basic Concepts in Programming

As part of a C programming exercise, students were asked to write a program that counted the number of even values in an array. This relatively simple task aims to evaluate their understanding of loops, conditions and basic arithmetic operations. However, one student asked a pertinent question: ‘What is an even number?’ Though this is an isolated case, it highlights a significant gap in elementary arithmetic that should be addressed from primary school onwards. It shows how basic concepts can be forgotten or never understood, perhaps because people rely on digital tools that do the calculation for them, such as calculators or generative AIs. More broadly, this reflects an erosion of active memory, in line with Thamous’s critique of writing as merely an external reminder.

Example 2: Difficulties in Basic Geometry - Symmetry of a Square

In the first exam for the subject ‘Learning Imperative Programming’, students were required to find the coordinates of a square that was symmetrical with respect to the Y-axis in an orthonormal coordinate system.

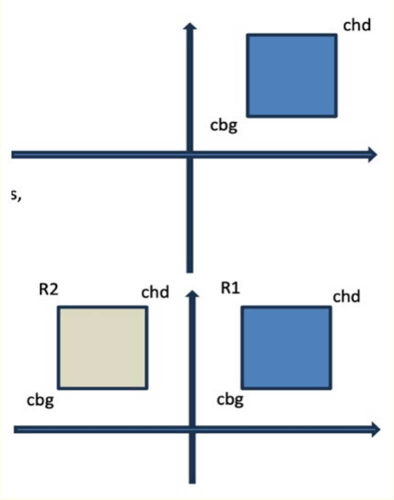

Figure 1: Calculate the coordinates of the brown square emanating from the blue square.

This exercise requires skills in both geometry (axial symmetry) and programming (coordinate manipulation). The results are alarming: 40 copies were entirely blank (or almost blank), indicating a complete lack of effort; 30 copies contained illogical solutions; and the remaining 42 copies showed average results with some errors. This distribution not only highlights a lack of confidence, but also an inability to apply basic mathematical knowledge that is part of the secondary school curriculum. The fact that more than a third of students did not attempt the task suggests intellectual laziness or over-dependence on external aids, such as AI, which could generate code without students understanding the underlying principles.

Example 3: Elementary Calculations on a Right-Angled Triangle

"Given the following structure to represent a point in R^2:

Type Point2D = Structure

x, y: integer

EndStructure

Write an algorithm that allows the user to input three Point2D a, b, and c representing the vertices of a right-angled triangle at b (this is not to be verified). The points a, b, and c must be different; otherwise, display a message 'Error, identical points'. and the algorithm will end. If the three points are indeed different, the algorithm must display the perimeter of the triangle and the area of the triangle. You may use the following module (assuming it is written) that calculates the distance between two points:

Function distance (↓ p1, ↓ p2: TPoint2D): real

Obviously, you may write as many modules as seem useful".

The second exam set a more accessible exercise at a middle school level: calculating the perimeter and area of a right-angled triangle with a distance function between two points to simplify the process. The results were equally concerning between 30 and 40 copies were blank, reflecting total disengagement; Six students explicitly wrote in their papers that they did not know how to calculate the perimeter of a triangle, which is a basic concept; and a third of the copies (approximately 37) did not solve the area calculation, despite the simplicity of the formula (half the product of the sides forming the right angle). The remaining copies varied in quality, but overall, this 'catastrophe' in terms of basic mathematical knowledge suggests a cognitive decline, whereby even simple operations are outsourced to tools such as online calculators or AIs, without any internalisation taking place. This reinforces the idea that AI erodes the ability to reason independently by providing instant responses.

Example 4: Array Management and Operations on Sets

Set = Structure
elt: array of NBMAX TValues // The distinct values
nb: integer // The number of distinct values contained in the set

EndStructure

This structure is intended to represent sets containing values that may appear multiple times. The elt field contains the distinct values, and the nb field indicates the number of distinct values. For each distinct value, the val field indicates the integer value, and the occ field indicates how many times this integer value appears in the set.

For example:

If a set E contains 3 (2 times), 8 (1 time), and 5 (6 times), it can be represented by E of type TSet: E.elt=[{val:3,occ:2},{val:8,occ:1},{val:5,occ:6}]

E.nb=3 to indicate there are 3 distinct values in the set

If a set E is empty, it can be represented by E of type TSet: o E.nb=0 to indicate it is empty

An integer value appears only once in the elt array. It is the occ field that indicates how many times this integer value is present in the set. There can be no value present with 0 occurrences. The values are not sorted; they are in any order at your discretion.

3.a Write a module Add that adds an occurrence of an integer value v in a set E represented by a TSet. For example:

If E.nb = 0 and v = 5: the result will be E.elt = [{val: 5, occ: 1}], E.nb = 1 If E.elt = [{val: 5, occ: 1}], E.nb = 1 and v = 5: the result will be E.elt = [{val: 5, occ: 2}], E.nb = 1

3.b Write a module NumberOcc that indicates how many times an integer value v belongs to a set E represented by a TSet. For example:

If E.elt=[{val:3,occ:2},{val:8,occ:1},{val:5,occ:6}], E.nb=3 and v=5: the result will be 6 If E.elt=[{val:3,occ:2},{val:8,occ:1},{val:5,occ:6}], E.nb=3 and v=7: the result will be 0 If E.nb = 0 and v = 5: the result will be 0

3.c Write a module Cardinal that indicates the cardinal of a set E represented by a TSet. For example: If E.elt = [{val: 3, nb: 2}, {val: 8, nb: 1}, {val: 5, nb: 6}], E.nb = 3: the result will be 9

If E.nb = 0: the result will be 0

The third exam focused on array management and comprised three sub-tasks worth a total of 7 points: adding a structured value to an array to simulate sets; finding the number of occurrences of an integer value; and calculating the sum of all occurrences of values. Out of 111 copies, one third were blank; another third showed an attempt at writing an algorithmic solution that was not completed; and the final third allowed a few points to be awarded, with only eight copies achieving between six and seven points. This balanced yet weak overall distribution suggests a persistent difficulty in structuring algorithmic thinking, even for basic programming operations. The gaps in data manipulation suggest that students, accustomed to delegating these tasks to AI tools such as ChatGPT, find it difficult to devise manual solutions, thus perpetuating a dependence that undermines their cognitive autonomy.

These concrete examples confirm an alarming intellectual decline, where reliance on AI exacerbates existing gaps by favouring cognitive superficiality. They highlight the need for pedagogical reform that integrates AI as a complementary tool rather than a substitute in order to restore intellectual effort and deep conceptual understanding.

Conclusion

By comparing Sam Altman to Theuth, this article draws attention to a recurring mistake in the history of technology: the tendency to idealise cognitive innovations as universal solutions to ignorance and inequality when they often encourage intellectual delegation, create an illusion of mastery and foster dependence, thereby undermining the foundations of human cognition. Although AI shows promise in personalising learning, democratising knowledge and accelerating discoveries, it risks fostering a presumption of knowledge among young people. This is evidenced by cognitive declines observed in numerous empirical studies, including reductions in critical thinking, memory, autonomy, intrinsic motivation and problem-solving. To avoid this, a prudent, balanced and multidisciplinary approach is essential. This involves integrating AI as a complementary tool rather than a substitute by promoting AI literacy, active pedagogical approaches that encourage cognitive effort and ethical regulations that mitigate biases, over-dependence and algorithmic hallucinations. It is also important to foster collaborations between educators, philosophers and developers. In this way, we can transform AI into a true ally of wisdom rather than an ambiguous 'pharmakon' — a term coined by Plato to describe something that can be both a remedy and a poison — and remain faithful to his timeless warning about the dangers of cognitive externalisation. In the long term, this will require redesigning educational systems to prioritise unique human skills such as creativity, empathy, adaptability and emotional intelligence in a world where AI dominates routine and analytical tasks. Without this vigilance, we risk impoverishing society cognitively, where technological convenience masks a loss of intellectual depth and an increase in superficiality and vulnerability to algorithmic manipulation. This article therefore calls for future longitudinal research to evaluate reversible and irreversible impacts, balanced representation of all perspectives (both optimistic and critical), and collective reflection on balancing innovation and prudence.

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