

# EFFECTIVE LEARNING WITH ARTIFICIAL INTELLIGENCE IN LITERACY AND MATHEMATICS

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## On Present AIs

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A little more than a year ago, under the name DOCENTIA, the Unit for Education and Artificial Intelligence began its work within the Secretariat of Education's Advisory Division. Part of its mission was to develop a national plan to address, in a centralized yet collaborative manner with all the country's jurisdictions, the methodological incorporation of artificial intelligence into education.

Following explicit approval by the Secretary, the Minister of Human Capital, and the President of the Nation, the presidential office announced the launch of **PAIDEIA** on May 14 of this year: P.A.I.D.E.I.A., the **Argentine Program for Educational Innovation with Artificial Intelligence**. The program's name is no coincidence. Its classical Greek echo — *παιδεία* — evokes an educational activity that transcends utilitarian or fragmented views, regarding the human person as a whole. This etymological resonance defines the humanistic essence of the Program: artificial intelligence is conceived as a powerful instrument for extending human rationality. Likewise, the sequence of the terms in its name reflects a deliberate hierarchy: innovation in education comes first, followed by "with" artificial intelligence — and not the other way around.

My colleagues at the Secretariat will later elaborate, in various panels, on the program's objectives, cross-cutting principles, current challenges, and ongoing projects — including the *Guide for the Integration of AI in Education* and, in cooperation with the Federal Council, the *Permanent Observatory of AI in Education*.

Recently, I had the opportunity to present PAIDEIA at a European conference that gathered representatives from more than forty countries around the world, including a ministerial meeting with delegates from roughly ten national governments. Happily, there was broad agreement on the importance of maintaining a human-centered narrative in the application of AI to education — a convergence that I consider a profoundly encouraging sign. Yet, once we turn that first page, we find ourselves confronted with a far more complex challenge: how to operationalize this human-centered concept. That is, how to truly place the human person at the core when integrating the impersonal presence of AIs as participants — or, to borrow Latour's term without correction, as *actants* — endowed with enormous and ever-growing capacities for automation.

Among the various dimensions of this issue, I wish to align myself with what other, and certainly better, speakers will later emphasize: the inalienable role of the teaching professional in the learning process.

At this very forum last year, I spoke —perhaps offering more questions than answers— about the need to change the prevailing narrative around artificial intelligence. I referred then to the three *inter-* that inter-ested me most:

- **Inter-disciplinary** approaches, to ensure that education and AI are addressed together and coherently;
- **Inter-sectoral** action, to build a digital citizenship fostered by an educating society at all levels; and
- **Inter-personal context**, as the privileged space for the real encounter between teachers and learners.

A current development of those ideas leads me to a firm conviction: it is impossible to implement AI in education with a genuinely humanistic focus — one that places the person at the center — without urgently deepening three key dimensions:

- the cultivation of cognitive abilities as both means and ends of learning;
- the social dimension of education; and
- the profound influence of global digital culture.

Cognitive abilities are both the means and the ends of learning. As means, functions such as attention, working memory, active language, abstraction, reasoning (through deduction and inference), and metacognition enable proportional access to the truth of things — they regulate cognitive load, allow for the formation of concepts, and support judgment and justification. These functions therefore shape the didactic structure: scaffolding, sequencing, spaced practice, and feedback. At the same time, these very abilities become ends of education when they consolidate into intellectual habits — epistemic virtues — that consistently orient the mind toward truth, practical rationality, and transfer across domains. They not only serve learning; they become what is learned. Hence, an effective integration of AI in education cannot be reduced to using skills for mastering content; it must also cultivate content to perfect those skills, while integrating criteria of truth and meaning. Learning with the assistance of AI should involve not only progress in knowledge of the world, but also in the cognitive abilities refined through that very process of knowing.

The teaching–learning experience possesses a constitutive social dimension: it is, fundamentally, an intersubjective activity granting shared access to a common world. As we all learned —sometimes painfully— during 2020 and 2021, knowledge produced in isolation is impoverished. Human knowing emerges from cooperative practices of joint attention, shared language, and epistemic norms: giving reasons, asking for evidence, and correcting errors that make objectivity possible. The mediation of the teacher —through modeling, scaffolding, and emotional regulation— and the community of inquiry, in which peers dialogue, disagree, and co-evaluate, not only enhance understanding but also establish public habits of knowing: epistemic justice, interpretive charity, responsible trust, and argumentative discipline. Thus, the social dimension is both a means (because it organizes effective learning situations) and an end (because it forms citizens capable of seeking truth together). There is therefore no genuine integration of AI in education without communal spaces of practice where the internal good of knowledge is cultivated as a common good.

Finally, we cannot ignore how the global digital culture now shapes the attentional ecosystem in which students learn. Their cognitive habits inevitably condition how they receive any technological mediation, including AI, in formal education. All algorithmic platforms —no longer just “social networks”— enable networked cognition (synchronous collaboration, ubiquitous access, externalized memory) while simultaneously curating salience, notification rhythms, click economies, and dopaminergic loops. These dynamics promote fragmentation, presentism (the shrinking of temporal attention to ever-shorter intervals), and confirmation bias. AI enters this ecosystem as a socio-technical artifact: not as an epistemic peer, but as a tool that amplifies such dynamics — speed, plausibility, and personalization. It can therefore both enhance learning and distort judgment if proper counterbalances are absent. Accordingly, the educational use of AI —and education about AI— must include:

- **Algorithmic literacy:** understanding provenance and traceability of sources, calibrating trust, detecting bias;
- **Attentional hygiene:** cultivating healthy media diets and deep-time focus; and
- **Epistemic virtues applied to AI:** prudence, intellectual honesty, and accountability.

Only in this way can a globalized digital culture —often driven by non-educational aims— cease to impose its transactional logic, allowing AIs to serve knowledge itself and the quality of the learning process.

The Secretary has often noted how little the grammar of education has changed in nearly two centuries. Allow me to draw an analogy from the most iconic scene of the martial arts classic *Enter the Dragon*. The antagonist breaks wooden boards to show strength and skill, and Bruce Lee calmly replies, finger raised: “Boards don’t hit back.” Multimedia tools, for all their remarkable support, did not constitute a genuine before-and-after in education — as Justin Reich has rightly observed. However, to use the grammar we already know never before have we had “talking desks” or blackboards that “write on their own”. The pseudo-agency of this new technology —which simulates knowledge and autonomy— places us before a unique opportunity: to rethink the instrumentality of education, not through the techno-optimism of the marketplace, but with a renewed hope that these tools may cooperate in the change that real human actors must ultimately bring about.