



# ARTIFICIAL INTELLIGENCE, HUMAN INTELLIGENCE, AND EDUCATIONAL PROCESSES

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## SUMMARY

- ✓ What is information and what is knowledge
- ✓ What is learning
- ✓ The role of imagination in human thought and practice
- ✓ How artificial intelligence appears intelligent
- ✓ The current distance between artificial intelligence and human intelligence
- ✓ Artificial intelligence in the educational relationship

The application of artificial intelligence (hereinafter AI) in education requires the contribution of educational and social sciences to develop its informed use. This article aims to explore the differences between AI and human intelligence to clarify the reasons why AI can be one of the artifacts that mediate the educational relationship, while it cannot assume the role of teacher or expert in the educational relationship. Instead, educational and training institutions must be given the role and responsibility of supporting and promoting human cognitive abilities. This issue is addressed with an approach influenced by the Cultural-Historical Activity Theory (CHAT), whose founder is Vygotsky (1987, 1999).

## WHAT IS INFORMATION AND WHAT IS KNOWLEDGE

Information, the basic element of AI, represents building blocks for knowledge. It is acquired, but without a cognitive and collective elaboration that places it in a context and gives it meaning, it remains mere notion. "Cristina is distracted this morning," says a teacher, for example. This is a piece of information, but on its own, it does not say much. Another teacher adds: "I heard her mother is ill." This is another piece of information. Together, these two pieces of information begin to say something meaningful, but they require further information, and above all, social and affective relationships, intuitions, and imagination. In these, capacities (or skills, two terms we use interchangeably here) act to fully understand what significance to attribute to the observation that Cristina is distracted this morning.

According to a perspective influenced by Lum (2009), knowledge is a complex of skills and understandings:

- ✓ The skill to perceive and recognize the relevance of information and theoretical and practical know-how;
- ✓ The skill to discern information and know-how useful for the purposes of action in non-standard situations;
- ✓ The skill to recognize context rules and to self-regulate, including in accordance with one's own values;
- ✓ The capacity to understand thanks to structures of intelligibility previously acquired in a tacit, implicit, and unconscious manner (pre-reflective understanding, which we refer to here as intuitions);
- ✓ The capacity to give sense and meaning to what one knows.

These skills and understandings develop thanks to human bodies, which, through their physical and biological structure, are in contact with the world and have taken shapes and postures in relation to the environment. These are bodies governed by complex systems of functioning that generate sensations and emotions. Thought is always imbued with emotions and sensations coming from the body and from relations with others and with contexts (CHAT perspective). Human beings are constantly active in collective and material activity ecosystems in which they mediate their acts and actions with what they know. And what they know stems from unique constellations of experiences of participation in collective and material activities (Leontiev 1978, Leontiev 1981) subjectivized (Stetsenko 2005), through which they have developed skills and capacities to understand in relation to others.

## WHAT IS LEARNING

Learning occurs within the relationship between expert knowledge and knowledge gaps among individuals with human bodies in proximal development spaces (the Zone of Proximal Development popularized by Vygotsky) contextualized in activity ecosystems. In this passage, we use the notion of "experiential knowledge" interchangeably with "knowledge" to convey the idea that knowledge does not reside solely with the teacher. The learner also has developed experiential knowledge that must be taken into account in the educational relationship. In the educational relationship, various artifacts appear that mediate the relationship between the subjects (teachers and learners) and the object<sup>1</sup> of the educational activity, which is the development of knowledge as defined in the previous section.

Classrooms, laboratories, various equipment, texts, registers, etc., are all artifacts, and they will increasingly be equipped with AI. The use of AI-equipped tools can be individual and is not necessarily shared: the teacher might use it for their own purposes (carrying out administrative tasks, developing exercises, grading exams, etc.), while students use it to speed up the search for useful information to produce papers, perform exercises, or for personalized study pathways. This non-collaborative use of AI within the educational relationship currently seems to be the most frequent situation. According to a survey, there is a significant gap between student usage and teacher perception in Italy: while 36% of teachers believe that students never use it, in reality, 83% of students use generative artificial intelligence tools<sup>2</sup>. At the time of writing, the adoption of AI in Italy seems to be occurring in an unguided manner, outside of an educational relationship. We will return briefly to this point in the conclusions.

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<sup>1</sup> For an illustration of the relationship between subjects and objects in CHAT see for example chapter 3 in Migliore, M. C. (2013). *Older workers and learning in industrial activities: when objects and personal senses matter*, Institute of Education.

<sup>2</sup> Geniale, podcast, 2025, <https://fondazione-fair.it/geniale/>.

## THE ROLE OF IMAGINATION IN HUMAN THOUGHT AND PRACTICE

People use imagination constantly while developing explanations, which is to say thought, when faced with something they do not understand, do not know, or that is radically different from what they already know. Or, more frequently—as Pelaprat and Cole (2011) point out—when it is necessary to form images to complete and fill the "gaps" (lacunae, voids) of missing information in daily experiences. According to these authors, "gap filling"—the filling of voids with imagination—is a continuous activity of thought that enables action and the pursuit of desired goals. These gaps are created by the conditions in which humans find themselves: they do not know everything that preceded that moment, and this lack of knowledge intertwines with that regarding the object of action in the present.

To return to the previous example, Cristina's teacher knows that Cristina is currently distracted, but she does not know everything that happened to her beforehand. She struggles to establish what weight to give to her distraction, and this uncertainty (gap) intertwines with the educational goals she had set for Cristina, which involve a specific activity that day. To this, we must add the biological-emotional conditions of the subjects involved, such as—continuing with the example—the fact that the teacher does not feel entirely well that day. Yet, the cognitive and psychological functions of the teacher must find a way to proceed in order to continue the ongoing activity.

This is what happens in daily life: humans constantly form images and ideas, also based on intuitions<sup>3</sup>, to fill knowledge gaps and move forward with actions that are relevant and meaningful to them at that particular moment. Imagination can expand the capacity to understand, but it can also limit it when it develops false beliefs (Tateo 2015). In any case, with the activity of thought constantly enriched by the formation of images, our Self also emerges in relations with the ecosystems in which we are immersed.

## HOW ARTIFICIAL INTELLIGENCE APPEARS INTELLIGENT

At the current stage of development, AI is based on computational<sup>4</sup> and connection capabilities. In cognitive sciences, computational thinking is the thinking of problem-solving, and it derives from the application of computer science principles: decomposing a problem, identifying patterns and the subsequent steps to solve it, and finding and correcting errors.

The AI we know is a syntactic engine that analyzes sentences, decomposes them, and processes symbols without understanding their

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<sup>3</sup> Intuitions are sensations, ideas, and images that emerge from connections of which we are unaware. We recalled this concept in the fourth point in Lum's presentation of knowledge.

<sup>4</sup> Retrieved from AI Overview with the prompt "computational thinking definition in cognitive psychology" on October 24, 2024. The findings of AI Overview are consistent with those reported by Guile and Popov 2024.

meaning, following rules imposed by its developers. AI relies on massive volumes of data and statistical and logical models to use them. It is governed by algorithms (complex equations) that AI cannot modify at present without human intervention. It is "a form of statistical engineering applied to language, a mirror trained on our words that reflects plausible patterns back to us, rather than truth or an understanding of the world."<sup>5</sup> The responses of generative artificial agents, such as ChatGPT, Claude, or Copilot (generative pre-trained performers), depend on their training and what they were developed for. Currently, they render certain aspects visible while hiding others, depending on how they were built.

## THE CURRENT DISTANCE BETWEEN ARTIFICIAL INTELLIGENCE AND HUMAN INTELLIGENCE

An example to illustrate the difference between a relationship with AI and one with a human being: if we ask a generative model like ChatGPT to provide us with recipes for cooking a certain type of fish, we obtain answers processed by algorithms using an architecture that simulates our neural networks, selecting—based on probabilistic associations—texts and words coherent with our prompt. ChatGPT has not felt empathy for us, nor annoyance at being bothered at a moment when it was thinking about something else, and it has no experience with cooking. Even if it is an agent trained by us or someone else on culinary topics, its experience is still composed solely of words connected probabilistically, and it has no memories of what difficulties it encountered cleaning the fish, where it bought the fish, or what it feels like to taste a dish. If, instead, we ask a friend—an expert in cooking fish—to recommend a recipe, they will be able to offer us many more details and perhaps warnings, knowing our level of ability. Yes, it is true, we can provide ChatGPT with our profile, but it will be a short text, not nearly as rich as the experience of our expert friend. In the relationship with our friend, a thousand other small signals, stimuli, and suggestions can be woven in regarding the experience of cooking fish—an experience made of manual skill, emotions, and feelings—which can expand to considerations of what she already knows about our kitchen or our family, without us having to tell her (context, environment, relations), and driven by the history and characteristics of our friendship. In other words, our friend can have an intentionally empathetic understanding of the situation, through imagination, to show us affection and friendship (or for other purposes that nevertheless give meaning to her actions), while an LLM (Large Language Model, the type of model on which generative agents function) lacks autonomy-defined intentionality, empathy, imagination, values, and goals.

Thus, what is called artificial intelligence simulates certain human cognitive capacities, making it appear as intelligent as humans, and sometimes even more intelligent. But this is an illusion: it seems more

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<sup>5</sup> Il Post, "Those who study artificial intelligence wouldn't stop it even if they could," July 18, 2025, interview with Walter Quattrociochi, professor of computer science.

intelligent because it is capable of processing a vast amount of information and creating connections in a very short time compared to human capacities. However, we have seen above that information is not knowledge. In humans, knowledge is something far more complex than the simple statistical and probabilistic processing of information without understanding its meaning and context<sup>6</sup>. Human connections are not probabilistic. Humans construct meaningful and relevant connections for their goals and desires in relation to other people in ecosystems of collective and material activity.

Therefore, AI tools currently have major limitations of which we must be aware. We believe that, despite these limitations, it is nevertheless important to use them, understand how they function, and develop supportive practices in the educational field.

## ARTIFICIAL INTELLIGENCE IN THE EDUCATIONAL RELATIONSHIP

AI can either enhance and expand the capacities of teachers, or replace them in the educational relationship with learners. The advantages and disadvantages of these two models of AI adoption depend on the education system and the level of human development achieved by the learners. In the case of very young people—such as in kindergarten, primary, and lower secondary school—the educational relationship with adults is fundamental for the formation of the Self and higher cognitive and psychological functions (Vygotsky 1978). At the opposite extreme, we find the case of adults in the vocational training system, who generally possess a more defined Self, more developed mental functions, and a broader and richer wealth of experience and knowledge.

Given the available space, we limit our consideration to the adoption of AI tools to enhance and expand teaching activities in the first cycle of the education system, for the 6–14 age group.

AI brings benefits both to those in the teaching role and to those in the position of learning<sup>7</sup>. For teachers, AI enables the automation of repetitive tasks, support in material creation, and the analysis of data collected during teaching practice—including for the early detection of learning difficulties—as well as support for linguistic inclusion for non-native students. For students, AI provides immediate feedback, on-demand availability of materials, and the creation of personalized learning pathways.

However, there are also potential disadvantages to watch out for:

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<sup>6</sup> Indeed, we believe it impossible to provide a generative agent with the boundless amount of information and knowledge that constitutes the contexts in which we operate. LLMs possess vast quantities of information, but it remains largely incomplete, precisely because simply having information is not enough. Our contexts are made up of histories and evolutions of functionings and processes, sometimes contradictory, which must be discerned based on needs, desires, and objectives.

<sup>7</sup> To develop the text on the advantages and disadvantages of the 6-14 years old school system, we relied on the support of the artificial generative agent Claude.

- ✓ Algorithmic profiling of the learner, with the risk of reproducing starting inequalities and difficulty in modifying their placement over time;
- ✓ The transformation of the educational relationship into a surveillance system through automated monitoring, which induces performance anxiety and reduces creativity and imagination;
- ✓ Assessment based on the measurement of quantifiable learning outcomes, risking making other aspects of development invisible, such as the capacity to manage ambiguity, creativity, critical thinking, and the capacity for ethical judgment.

The assessment of the student, on the other hand, is a process that is best conducted and guided by teachers, enabling them to leverage data, perceptions, and intuitions arising from the educational relationship. Assessment occurs within a meaningful human relationship in which the adult can act as a mirror to the learner's developing identity. Furthermore, assessment understood as a collaborative, collegial process can become an opportunity for organizational and instructional learning for educational institutions.

## CONCLUSIONS

As a research entity also dealing with education and vocational training, it would be of interest to begin collecting the practices being experimented with in educational and training institutions, in order to initiate a critical and learning reflection with stakeholders of the education and training system on how to integrate AI-enabled devices into educational processes and relationships. It could also provide an opportunity to address the issue of how educational and training goals and curricula must adapt to ensure that the adoption of AI tools enhances human cognitive functions rather than replacing and diminishing them, which risks impoverishing the expert skills required to guide AI.

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