ARTIFICIAL INTELLIGENCE AS HUMANITY'S OFFSPRING: EDUCATIONAL RESPONSIBILITIES IN THE AGE OF DIGITAL INNOVATION.

Enza Sidoti[1]
Università degli Studi di Palermo
enza.sidoti@unipa.it

Lorenzo Marrali
Università degli Studi di Palermo
lorenzo.marrali@unipa.it

Double Blind Peer Review
Citation
Sidoti, E., & Marrali, L. (2026). Artificial intelligence as humanity's offspring: Educational responsibilities in the age of digital innovation. *Italian Journal of Health Education, Sport and Inclusive Didactics*, *10*(3).

Doi: https://doi.org/10.32043/gsd.v1i3.98

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gsdjournal.it
ISSN: 3103-5744

ABSTRACT
This theoretical paper explores the relationship between education and artificial intelligence through the concept of educational responsibility. AI is interpreted as a product of human intelligence and, therefore, as a technology requiring ethical and pedagogical guidance. After reconstructing the evolution of AI, it examines the educational implications of intelligent technologies, highlighting the need for a critical culture that directs their use toward formative and human-centred purposes.

KEYWORDS
Artificial intelligence; educational responsibility; pedagogy; digital technologies; ethics of education.

Received 2026-06-09
Accepted 2026-10-22
Published 2026-10-30

[1] Enza Sidoti wrote the Introduction and Sections 1 and 3. Lorenzo Marrali wrote Sections 2; 4 and the Conclusion.

1. Introduction

The current development of artificial intelligence technologies represents one of the most significant transformations of our time, profoundly affecting the ways in which human beings produce knowledge, communicate, and organise social life (Floridi et al., 2018). AI no longer appears merely as a technical tool confined to specific scientific or industrial domains; rather, it has become a system of widespread technologies that are progressively entering everyday life and educational processes. Machine learning systems, generative models, and artificial neural networks are now capable of simulating certain cognitive functions traditionally attributed to human intelligence, such as language production, data analysis, image generation, and support for decision-making processes (UNESCO, 2023; Zawacki-Richter et al., 2019). This transformation cannot be interpreted exclusively in technological terms; rather, it implies a deeper shift that concerns the way we understand the relationship between technology, knowledge, and education. Indeed, artificial intelligence does not merely support human activities, but contributes to redefining the cognitive environments within which learning and knowledge production take place. From this perspective, the pedagogical issue concerns not only the use of AI in educational contexts, but also the meaning that these technologies assume within processes of personal formation and educational communities. The spread of AI therefore calls for reflection that cannot be reduced to the dimension of educational innovation or technological efficiency, but requires a more radical inquiry into the educational responsibility of human beings toward the very technologies they produce. Recent scientific debate has highlighted how artificial intelligence is profoundly transforming educational practices by introducing new tools for personalised learning, educational data analysis, and support for teaching processes (Holmes et al., 2019; Holmes & Tuomi, 2022). However, alongside these opportunities, significant questions also emerge concerning the ethical and pedagogical implications of using intelligent systems in educational settings. If digital technologies are integrated into educational processes without critical reflection, there is a risk that educational experience may progressively be reduced to a purely functional dimension, oriented toward data management and performance optimisation (Selwyn, 2019; Williamson & Eynon, 2020). In this context, pedagogy is called upon to question not only what technologies make possible, but also the kind of relationship human beings establish with them. AI systems are not autonomous entities generated independently of human agency; rather, they are constructed, trained, and shaped by the design choices and cultural orientations of human communities. In this sense, they may be understood, at least in part, as products of human creative activity and as expressions of the

knowledge and values that shape the societies that produce them. Such a perspective raises a fundamental pedagogical question: if intelligent technologies are generated by human beings, then we cannot evade educational responsibility toward them. In this contribution, educational responsibility is understood as the commitment to answer for the world handed over to new generations (Arendt, 1961), to take charge of the consequences of technical action (Jonas, 1979/1984), and to care for the relationships that make human growth possible (Bellingreri, 2010; Mortari, 2015). This theoretical contribution, based on a critical analysis of philosophical and pedagogical literature, is situated within this line of inquiry and aims to offer a pedagogical reflection on the relationship between education and artificial intelligence, starting from the concept of educational responsibility. The guiding hypothesis of this work is that artificial intelligence, as a product of human intelligence, cannot be conceived as an entity entirely autonomous from human educational action. On the contrary, it requires a form of educational responsibility that concerns the ways in which these systems are designed, trained, and integrated into social and educational contexts.

2. From human intelligence to technology: conceptual framework

The concept of intelligence runs through the entire Western philosophical tradition, assuming different meanings while consistently maintaining a deeply anthropological dimension. The term derives from the Latin *intelligere*, which refers to the capacity to grasp relationships and meanings within reality. From this perspective, intelligence cannot be reduced to a mere set of logical operations or computational abilities; rather, it must be understood as a faculty that enables human beings to interpret the world and orient their actions. In classical philosophy, Aristotle described the intellect (*nous*) as the capacity to apprehend the intelligible forms of things and to understand the principles that organise experience. Intelligence, in this sense, does not coincide with calculation, but with a form of understanding that enables individuals to grasp the meaning of reality and attribute significance to human actions. In the modern age, the concept of intelligence was progressively reformulated in relation to the development of mathematics and logic. Thinkers such as Leibniz envisioned the possibility of reducing reasoning to forms of symbolic calculation, hypothesising a universal language capable of representing human thought through formal operations (Cassirer, 1923/1953). Hence emerged the idea that certain dimensions of thought could be expressed through logical and mathematical procedures. Calculation thus became one of the instruments through which human intelligence organises and structures knowledge. However, modern philosophical reflection also revealed an awareness that human thought cannot be entirely reduced to computational operations, since

it entails interpretative, relational, and ethical dimensions that exceed purely mathematical formalisation. The relationship between intelligence and technology is situated precisely within this tension. The history of technology shows how the tools created by human beings have always been the result of their capacity to design, anticipate, and transform the world. Technology does not merely represent a set of functional tools; rather, it constitutes a fundamental dimension of human action (Jonas, 1979/1984). As several contemporary studies on the relationship between technology and society have emphasised, technologies are always cultural products that embody worldviews, values, and models of knowledge (Floridi et al., 2018). Every technology thus reflects the ways in which human intelligence organises reality and constructs systems of meaning. This perspective is particularly relevant from a pedagogical standpoint. If technologies are products of human intelligence, they cannot be considered neutral devices detached from the responsibility of those who design and use them. Every technological device carries with it an implicit vision of learning, knowledge, and human action. For this reason, educational research cannot be limited to observing the effects of technologies; rather, it must critically examine the processes through which they are designed and integrated into social and educational contexts. The development of artificial intelligence as a field of inquiry emerges within this theoretical framework. The idea that certain cognitive functions can be simulated by machines derives precisely from the possibility of representing some processes of human thought through computational systems and algorithmic models. However, understanding the meaning of artificial intelligence first requires reflection on the very concept of intelligence and on the relationship between human thought and technology. Only from this perspective is it possible to adequately examine the pedagogical implications of intelligent technologies.

3. From symbolic AI to machine learning: stages of a technological evolution

The emergence of artificial intelligence as an organised scientific field can be traced back to the second half of the twentieth century, within a historical context shaped by the development of computer science and cognitive science. The term artificial intelligence was introduced in the 1955 proposal for the Dartmouth Summer Research Project on Artificial Intelligence, held in 1956 and organised by John McCarthy, Marvin Minsky, Nathaniel Rochester, and Claude Shannon. Within that context, the hypothesis emerged that certain human cognitive processes could be described through formal models and therefore simulated by machines. The underlying assumption was that thought, at least in some of its components, could be represented as a system of symbolic and replicable operations (McCarthy et al., 2006). Early research in the field of

artificial intelligence primarily focused on the construction of systems capable of solving logical problems, playing chess, or proving mathematical theorems. During this initial phase, often referred to as the era of symbolic AI, intelligence was conceived as the manipulation of symbols according to formal rules. This perspective developed in continuity with the modern conception of thought as calculation and found expression in programs capable of imitating certain forms of logical reasoning. From the 1980s and 1990s onward, the field of artificial intelligence underwent a significant transformation with the introduction of approaches based on machine learning. Rather than explicitly programming all the rules required to solve a problem, systems began to be designed to learn directly from data through statistical processes and complex mathematical models. Artificial intelligence thus evolved into a set of techniques capable of recognising patterns, classifying information, and generating predictions based on large quantities of data. In recent years, this process has accelerated significantly through the development of artificial neural networks and deep learning techniques. These systems, partially inspired by the structure of biological neural networks, are capable of processing vast amounts of data and progressively improving their performance through experience. Applications such as image recognition, machine translation, and generative language models currently represent some of the most visible expressions of this technological evolution (UNESCO, 2023). However, when observed from a pedagogical perspective, the history of artificial intelligence cannot be interpreted solely as a form of technical progress. It also represents a cultural transformation that concerns the ways in which contemporary societies conceptualise intelligence, knowledge, and learning. AI systems are not entities independent of the cultures that produce them; rather, they are designed, trained, and shaped through data, models, and decisions that reflect the choices of human communities (Floridi et al., 2018). For this reason, machine learning systems remain deeply connected to the social and cultural contexts in which they are developed (Holmes et al., 2019). Here, the educational question becomes central. Education is therefore called upon to interrogate not only the use of intelligent technologies in educational settings, but also the ways in which they are constructed, directed, and integrated into social life. It is from this standpoint that the following section examines the presence of AI in educational contexts.

4. AI in educational contexts

The evolution of digital technologies and the development of artificial intelligence have generated significant transformations in educational systems over recent decades. Information and communication technologies have progressively expanded modes of access to knowledge, reshaping learning

environments and teaching practices (Panciroli & Rivoltella, 2023). In this context, artificial intelligence represents a new phase of technological evolution that directly affects educational processes by introducing tools capable of supporting teaching, analysing learning-related data, and personalising students' educational pathways. The scientific literature highlights how AI-based systems can contribute to improving the effectiveness of educational processes through data analysis and the adaptation of instructional content to students' individual characteristics. Technologies such as learning analytics systems, adaptive learning platforms, and intelligent tutoring systems make it possible to collect and analyse information regarding students' activities, offering teachers useful tools to monitor progress and design more targeted educational interventions (Bond et al., 2024; Zawacki-Richter et al., 2019). In this respect, artificial intelligence may represent a significant resource for fostering more flexible and personalised learning processes. At the same time, these transformations raise new pedagogical questions. The use of automated systems in educational contexts modifies the relationship between teachers, students, and knowledge. While digital technologies may broaden opportunities for access to information and encourage new forms of collaborative learning, there is also the risk that educational experience may progressively be reduced to a purely technical dimension centred on data analysis and performance optimisation. Students may thus be regarded primarily as sets of data to be monitored and analysed, rather than as subjects engaged in complex educational processes. From a pedagogical standpoint, this implies the need to maintain a critical perspective on educational technologies (Selwyn, 2019, 2024). Education cannot be reduced to an automated process of content transmission or information management. It entails relational, interpretative, and ethical dimensions that can hardly be replaced by technological systems. As several studies in the field of artificial intelligence in education have emphasised, intelligent technologies should be considered tools that support educational action rather than substitutes for the pedagogical relationship between teacher and student (Holmes et al., 2019). In this light, the role of educational responsibility becomes increasingly evident. The introduction of artificial intelligence into educational contexts concerns not only the adoption of new instructional tools, but also cultural and pedagogical choices that shape the ways in which technologies are integrated into educational processes. Human beings are not merely passive users of digital technologies; rather, they are the actors who design, develop, and determine their modes of use. Consequently, the evolution of intelligent technologies is closely linked to the educational and cultural choices of contemporary societies. It is precisely at this point that the central issue of this contribution emerges. Education concerns not only the

formation of individuals in a digital society, but also the responsibility of human communities toward the technologies they themselves generate. Pedagogical reflection can therefore contribute to examining the relationship between human beings and artificial intelligence through the concept of educational responsibility, understood as the capacity to orient technological development toward authentically educational and human ends.

5. Artificial intelligence and human responsibility: a pedagogical perspective

The emergence of artificial intelligence technologies raises a pedagogical question that concerns not only their use in educational contexts, but also human responsibility toward the technological systems that human beings themselves produce. If intelligent technologies are the result of human design and cognitive activity, they cannot be separated from the responsibility of those who generate them. Artificial intelligence thus remains embedded within the cultural and educational choices of the societies that develop it. Pedagogical reflection can help clarify this relationship by drawing on the concept of educational responsibility. Hannah Arendt (1961) argued that education represents the sphere in which societies assume responsibility for the world they hand over to future generations. To educate means to take responsibility for what exists and to guide its transmission over time. In a society increasingly characterised by the presence of intelligent technological systems, this responsibility concerns not only individuals, but also the technical tools and infrastructures that contribute to organising social life. A similar perspective emerges in Hans Jonas's reflection on the principle of responsibility. Jonas (1979/1984) argues that the development of modern technology has enormously expanded the power of human action, making it necessary to establish a new ethical horizon capable of guiding the use of technologies. Human beings must assume responsibility for the consequences of their technical actions and for the forms of power they generate. Applied to intelligent technologies, this perspective implies that the development of artificial intelligence cannot be considered a purely technical or neutral process but instead requires ethical and pedagogical reflection on the ways in which such systems are designed, trained, and used. From an educational perspective, this responsibility also takes on a formative dimension. John Dewey (1938) emphasised that education consists in the construction of environments of experience that shape the development of human intelligence and action. Technical tools are part of these environments and contribute to shaping the ways in which individuals learn and interpret the world. Intelligent technologies are therefore not simply external tools within educational experience, but elements that actively participate in configuring learning environments and processes of knowledge construction. At the same time, critical pedagogy has

highlighted how every educational process entails a dimension of awareness and social responsibility. Paulo Freire (1970) insisted that education cannot be limited to the transmission of content; rather, it must foster the development of subjects capable of critically understanding the world in which they live and assuming an active role in its transformation. Applied to the relationship between education and artificial intelligence, this perspective invites us to consider intelligent technologies not merely as tools to be used, but as phenomena that must be critically understood, questioned, and directed. Within this theoretical framework, educational responsibility toward AI systems may be interpreted as a task that concerns both technological design and human formation. As contemporary pedagogical reflection emphasises, education consists in promoting a deeper understanding of reality and the relationships that constitute it. Intelligent technologies must therefore also be considered part of a world that requires educational guidance. Bellingreri (2010) argues that education always entails responsibility toward others and toward the shared world, a responsibility expressed through the care of relationships and the construction of shared meanings (Mortari, 2015). Drawing these contributions together, educational responsibility can be defined as the duty of educators, educational institutions, and communities to answer for the shared world, to anticipate the consequences of technical action, and to care for the conditions that make human growth possible. If AI systems are generated by human creative and cognitive activity, they may legitimately be defined as humanity's "offspring." As such, they cannot be abandoned to purely technical or economic development. Human beings, as the creators of these systems, remain responsible for their orientation and for the consequences their development produces in the lives of individuals and communities. Ultimately, the question of artificial intelligence concerns not only the future of technology, but also the future of education. Examining educational responsibility toward AI systems means recognising that technological development cannot be separated from the development of critical awareness and from the construction of a culture capable of directing the power of technology toward authentically human ends. Educational responsibility toward artificial intelligence can be articulated on several levels. For teachers, it requires professional development that goes beyond the instrumental use of AI tools and enables them to understand how these systems work, recognise their limits and biases, and decide when and why to adopt them (European Commission, 2022). For students, it translates into forms of critical AI literacy that foster the capacity to evaluate automatically generated content and to use generative tools in ways that support, rather than replace, personal reflection (UNESCO, 2023). For educational institutions, it involves governance choices concerning data protection, transparency, and

human oversight, which are all the more relevant since the European regulatory framework classifies several AI systems used in education, such as those employed to evaluate learning outcomes, as high-risk (European Parliament & Council of the European Union, 2024). Finally, at the level of design, it calls for the involvement of educators and learners in the development and evaluation of intelligent technologies, so that pedagogical criteria, and not only efficiency, orient their development (Floridi, 2023; Holmes & Tuomi, 2022).

6. Conclusions

The transformations generated by artificial intelligence call for reflection that cannot be confined to the technical or engineering dimensions of digital technologies. Rather, they concern the ways in which contemporary societies interpret the relationship between knowledge, technology, and education. AI represents one of the most advanced expressions of the human capacity to design complex tools and extend cognitive possibilities through technology. However, precisely for this reason, it cannot be considered a phenomenon independent of the responsibility of those who produce it. This theoretical contribution has sought to show how pedagogical reflection can offer a specific perspective for understanding the relationship between education and artificial intelligence. Indeed, pedagogy does not merely question the effectiveness of technological tools in educational contexts; more radically, it is concerned with human formation and with the responsibility human beings assume toward the world they help construct (Mortari, 2015). Artificial intelligence may thus be interpreted as a new form of technological production that requires educational guidance capable of directing its development. The reference to educational responsibility highlights a dimension that is often overlooked in public debates on intelligent technologies. Understood as the commitment to answer for the shared world, to anticipate the consequences of technical action, and to care for the conditions of human growth, this responsibility takes concrete form in teacher education, critical AI literacy, institutional governance, and participatory design. Consequently, the development of artificial intelligence cannot be left exclusively to economic or technological dynamics but requires ethical and pedagogical reflection capable of orienting its use toward human and social purposes. Hence, education plays a decisive role in the future of intelligent technologies. It concerns not only preparing individuals for the conscious use of digital tools but also fostering the capacity of societies to develop a critical culture of technology. Educating for artificial intelligence means promoting a deeper understanding of the processes that govern its functioning and of the social implications arising from its use. The question that emerges, therefore, concerns not only how artificial intelligence

should be used in educational contexts, but also how artificial intelligence itself should be "educated" through the design, cultural, and ethical choices that shape its development. In this light, human educational responsibility toward intelligent technologies becomes one of the central challenges of contemporary societies. As a theoretical reflection, this contribution does not offer empirical evidence; future research could examine how these dimensions of responsibility are enacted in educational practices and policies. Examining such responsibility means recognising that the future of artificial intelligence will depend not only on technical innovation, but also on the capacity of human communities to direct technology toward purposes that promote human dignity, freedom, and personal development.

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