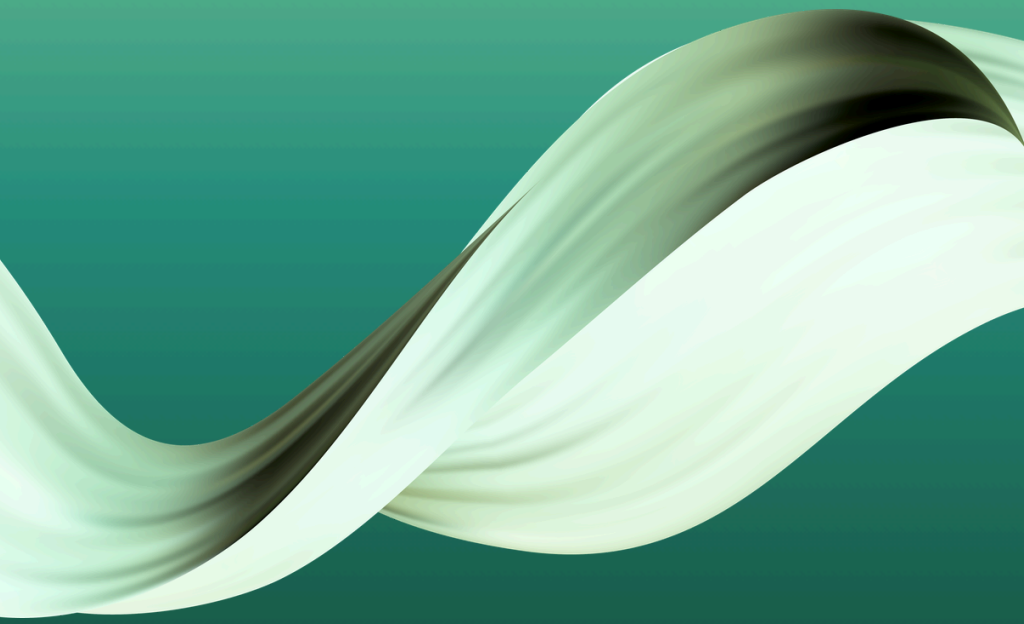
ALGORITHMIC HEARTBEATS

Affective Education in the Age of the Fourth Revolution



Edited by

FRANCESCO PELUSO CASSESE

PRESS

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Affective Education in the Age of the Fourth Revolution

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Algorithmic heartbeats: **Affective Education in the Age of the Fourth Revolution**

Foreword by Francesco Peluso Cassese

Eighty years ago, with the publication of *Evidence* (1946), Isaac Asimov was not merely writing about robotics; he was outlining the archetype of a dilemma that today inhabits our classrooms: the distinction between the human being and its perfect simulation. The figure of Stephen Byerley—an individual no one has ever seen eat or sleep, suspected of being an automaton—acts as a mirror in which contemporary generative Artificial Intelligence systems are now reflected. With almost unsettling foresight, Asimov described a "brain" around which a body was constructed, trained to become everything its creator could no longer be: "*He sent him out into the world … like an old, maimed teacher whom no one ever saw*".

This image of the "maimed teacher" operating behind the scenes of technology constitutes a particularly perfect metaphor for the current educational transition. We therefore find ourselves witnessing a race between those who metaphorically "*run to the pitchforks*", the so-called "humanoid fundamentalists," ready to denounce a new "Frankenstein Complex" in every algorithm, and, on the opposite side, the bad boys of the *D-Generation*, namely those who enthusiastically embrace the total automation of knowledge and learning processes.

While public debate remains largely stalled on issues of computational capacity, the real challenge unfolds on the terrain of empathy. If we return to Alan Turing's reflections on imitative capacity, an uncomfortable question emerges: if a machine is able to display forms of human-like behavior capable of satisfying a student's need for care and listening, does the "artificial" nature of that process necessarily invalidate its educational value?

Today, technology has reached a level of sophistication capable of *satiating* the need for emotional mirroring. Artificial intelligence no longer merely responds to logical queries; it performs affective narratives, modulates tone, and offers an unlimited availability that human figures, often overburdened and "maimed" by bureaucratic and social contingencies, struggle to sustain. The risk is not that machines become human, but that humanity grows accustomed to a form of synthetic affectivity, deprived of the weight of the body and the responsibility inherent in relationship.

Rather than erecting barriers to halt learning systems, we must learn to inhabit progress. For human beings to survive and flourish within the so-called Fourth Industrial Revolution, adaptation must occur through the contribution of new forms of meaning-making. The integration of AI into educational contexts is radically transforming relational dynamics: this is no longer merely a matter of digital literacy, but of **Digital Affective Literacy**, namely the capacity to critically and emotionally navigate affective interactions mediated by digital systems.

We must therefore reflect on how to cultivate authentic relationships within hybrid environments. If algorithms support or replace certain functions, such as assessment, explanation, even initial psychological support through chatbots, what space remains for educators? That space is the one of embodied emotional awareness, of managing conflicts irreducible to code, and of narrating the limits of human experience. For affective education not to remain merely an isolated lesson, but to become the beating heart of a technologically advanced school, it is necessary to move along the following strategic axes:

- **Educational and Social Robotics**

The use of mechanical interfaces as mediators for socio-emotional development, particularly in contexts of neurodiversity.

- **Ethics of Algorithmic Relationships**

  Educational approaches that enable students to distinguish between the effectiveness of simulation and the depth of human encounter, without demonizing the former while deliberately valuing the latter.

- **Emotionally Aware Learning Environments**

  The design of multisensory learning spaces in which technology does not function as a barrier, but as a transparent membrane that facilitates relational contact.

- **Generative AI as a Symbolic Mirror**

  The use of AI's narrative capacities to support students in naming and exploring their emotions, transforming digital output into a starting point for deep introspective reflection. The central question, therefore, is not how much technology needs humanity, or vice versa, but whether we are capable of designing an education that does not see machines as substitutes for the "heartbeat," but as amplifiers of our capacity to remain human in a rapidly changing world. The "algorithmic heartbeat" must not replace the impulse of the human heart, but challenge us to reconsider what it truly means to be human.

The REN International Conference aims to provide spaces and opportunities to explore these transformations and to imagine scenarios of intersection between the human and the artificial, where technological beats meet the affective dimension of education. The conference will bring together the scientific community to reflect on how to rethink relationships, learning environments, and educational practices in the age of the Fourth Revolution.

Main themes

1. **Ontology of Care and the Simulation of Empathy:** Theoretical and philosophical contributions exploring the boundary between human relationships and human–machine interaction.
2. **Social Robotics and Socio-Emotional Inclusion:** Research studies and practical experiences on the use of artificial agents to foster affective development, with particular attention to neurodiversity and Special Educational Needs (SEN).
3. **Generative AI and New Narratives of the Self:** The use of artificial intelligence as a creative tool to explore identity, emotions, and students' lived experience through digital storytelling.
4. **Hybrid and "Emotionally Aware" Learning Environments:** The design of physical and digital spaces that integrate sensors, algorithms, and multisensory technologies to monitor and support psychophysical well-being within the classroom group.

5. **Digital Affective Literacy and Citizenship:** Educational pathways aimed at developing students' critical thinking and emotional awareness in relation to algorithmic manipulation and social media.
6. **Teacher Education Between the "Frankenstein Complex" and the D-Generation:** Reflections and training models for teachers and educators engaged in the transition from traditional teaching to AI-assisted education, addressing resistance and technophobia.
7. **Kinesiology and Sport between Education and Performance in the European Area:** Contributions from physical education, motor learning and sport sciences exploring how movement, embodied experience and digital technologies support learning, well-being and inclusion.

Topic 1

Ontology of Care and the Simulation of Empathy

Are we heading towards a disembodied education?

Borgogni Antonio
Graticola Agnese
Acquaroli Dario
Sangalli Silvia

For centuries, scholars have debated the mind-body relationship as a fundamental puzzle, what Schopenhauer and Feigl termed the Weltknoten (world-knot) of scientific and epistemological enigmas. This complex binomial is now transformed by the irruption of Artificial Intelligence (AI) into daily life and academic writing: the physical body risks self-annihilation and disembodiment, while the mind appears replaceable. Sir Roger Penrose argues that "artificial intelligence" is a semantic misnomer because true intelligence requires consciousness, a trait machines will never possess. He distinguishes between cleverness (computation, pattern-matching, and precise formula application) and deep understanding. Grounded in Gödel's incompleteness theorem, Penrose asserts that consciousness involves non-algorithmic processes that computation alone cannot replicate. Outsourcing human intellect to AI downgrades humanity into unconscious entities. AI in search engines downgrades intellect by eliminating discovery and incidental learning; an alliance is needed to fund emancipatory algorithms that preserve curiosity. To counter this cognitive decline, pedagogy must find a new thread rooted in concrete, tangible human experience.

In this context, the physical body acts as a "Trojan horse." While physical presence is not a magical cure, it can actively slow down, confuse, and disrupt AI's apparent dominance. In educational settings, a "present body" contests overwhelming digital control and prevents cognitive atrophy by stopping the outsourcing of choices to algorithms. However, Byung-Chul Han notes that this outsourcing began earlier. Digital neoliberalism dismissed the physical body as an object of industrial production, relegating it to healthcare or aesthetic commodity to be purchased in gyms and beauty clinics. The transition from physical disciplinary spaces (schools, barracks, offices) to digital self-containment means obedience is now performed through bodyless actions like clicking "like." The traditional Foucauldian disciplinary regime exploited docile bodies and muscular energy as mechanical cogs to drill human beings into "labouring cattle". Conversely, the contemporary information regime exploits data and information rather than somatic energy. Access to data is the new tool for psychopolitical surveillance, behavioral prediction, and information capitalism, reducing humans to "consumer cattle". This creates a classless auto-exploitation where exploiters and exploited share the same digital tools, rendering social revolution impossible. Total transparency produces absolute conformity. Freedom from the disciplinary panopticon has merely transitioned into an even more efficient digital panopticon, where individuals submit voluntarily because they believe they are acting freely and creatively.

Panciroli and Rivoltella map this digital domain through three concepts: postmediality, which ends one-to-many mass communication and transforms spectators into authors; platformization, a light capitalism driven by reciprocal information flows where algorithms constitute our "informational self"; and datization, leading to a "code or data society" where code dictates social constructs. Educators face the dilemma of the inevitability of "what to do" regarding AI. Pragmatically, schools often resolve the mind-body problem by removing the body entirely, a trend accelerated by remote pandemic classes. In countries like Italy, the body is increasingly marginalized and regimented. Children are coerced into sitting for five hours, even during recesses, creating an unscientific "educational atrophy." When school lacks corporeal experience, AI and digital media risk becoming the preeminent forms of learning rather than integrated tools.

Han paints a discouraging picture of our post-factual society, invoking Hannah Arendt to contrast the stability of existential truth with the fleeting nature of information. In the information regime, truth

collapses into "informational dust" blown away by the digital wind. However, pedagogy is inherently voted to change and transform tension. To prevent this collapse, the educational paths proposed by Panciroli and Rivoltella must be substantiated by a radical "corporeal turn." Every day, the bodies of students and teachers swarm, inundate, and pervade school buildings, converting neutral, lifeless spaces into lively, embodied places where life occurs. A human, analogical turn is necessary to validate these somatic experiences. Historically emerging from complexity and feminist studies, the corporeal turn positions the body within modern social theory, fighting the traditional school habitus that renders the "body below the chest" invisible. Contemporary focus on the brain often neglects proprioception and kinesthesia; we must "de-elevate the brain" and value the tactile-kinesthetic body. To resist the digital wind blowing through educational routines, pedagogy requires a re-ontologization of the self through a re-ontologization of the body, changing its very nature from a passive object to an active subject. Ultimately, instead of merely discussing embodied cognition, contemporary education must provocatively champion the paradigm of an "enminded body".

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Simulating empathy: artificial Intelligence, ontology of care, and authenticity of the relational experience

D'Alessio Chiara
Errico Martina

The growing diffusion of artificial intelligence (AI) in healthcare, educational, and social contexts calls for reflection on the meaning of empathy, care, and relationships. Conversational systems are now capable of producing personalized responses that are perceived as empathetic. In medicine, and particularly in medical education, this transformation concerns not only technological efficiency but also the way in which we train professionals to relate to patients. The question is therefore not merely whether a machine can communicate empathetically, but whether an apparently empathetic interaction can change our understanding of care.

From an anthropological perspective, it is necessary to distinguish between the ability to simulate a behavior and the possibility of experiencing it. AI can process enormous amounts of information and respond rapidly, but its functioning remains based on the computational processing of data. As far as we can currently determine, it does not possess an embodied lived experience, phenomenal consciousness, personal vulnerability, or moral responsibility. Its ability to produce empathetic language does not therefore necessarily coincide with the ability to experience empathy. Human empathy, by contrast, develops between embodied subjects who share vulnerability, suffering, and finitude. Phenomenology has emphasized the role of the body in intersubjectivity, while neuroscience has highlighted the importance of embodied simulation. Empathy therefore involves the recognition of another person's emotional state, experience, affectivity, and responsibility.

The issue is made more complex by the natural human tendency to attribute social and mental characteristics to technologies. The "Computers Are Social Actors" paradigm demonstrates how people may apply to computers cognitive rules normally used in interpersonal relationships. When a system maintains continuity throughout a dialogue and responds sensitively to emotions, it becomes easy to interpret it as a subject endowed with intentions. The risk, especially in situations of loneliness and vulnerability, is that linguistic simulation may be confused with an authentic relationship. Continuous availability can be useful, but it may also encourage emotional dependence or reduce the motivation to seek human relationships.

Healthcare is one of the contexts in which this issue becomes particularly relevant. AI can contribute to health education, information management, patient monitoring, and the formulation of clearer communications, while also facilitating access to psychological support. Its value is significant when it enables professionals to reduce repetitive tasks and recover time for listening, clinical reasoning, and relationships. From this perspective, AI can contribute to making medicine more human, not by replacing the professional but by supporting them. The problem arises when communicative effectiveness is considered equivalent to the quality of care: an empathetic response from a chatbot does not thereby assume the moral responsibility inherent in a relationship. In the doctor–patient relationship, trust is also based on professional responsibility and the recognition of the patient's vulnerability.

Another critical element concerns the reliability of information. Generative systems can produce sophisticated but inaccurate responses; the more confident and persuasive the language appears, the more likely users are to attribute to the system a level of authority greater than what is actually justified. In healthcare, a patient might change their behavior or treatment on the basis of unverified recommendations. The use of AI in medical education and practice must therefore be accompanied by digital literacy, enabling students, professionals, and patients to understand both its potential and its limitations.

This issue must be considered within the broader framework of an ethics of care. Care does not simply consist of efficiently providing an answer or solving a problem; it also involves attention, responsibility, and recognition of the dignity of the other. Technology can support these practices, but it should not become their ultimate subject. This gives rise to principles such as transparency, accountability, human oversight, autonomy, equity, and the prevention of harm. Decisions that affect people's lives cannot be completely delegated to automated systems, particularly in healthcare; responsibility must remain identifiable from design through to use.

This perspective is particularly important for medical education. If AI is introduced exclusively as a tool for efficiency, there is a risk that the relational dimensions of medicine will be regarded as secondary. Students should instead be trained to use AI without delegating their professional judgment to it, developing human skills that become even more important when technology simulates communication: listening, empathy, clinical reasoning, ethical discernment, and responsibility. It is necessary to educate future professionals to distinguish between appropriate communication and an authentic relationship.

The simulation of empathy represents a challenge that is not merely technological, but also educational and anthropological. The future of medicine should be based on human–AI collaboration without replacing human presence. AI can organize information, reduce repetitive tasks, and facilitate communication; however, authentic listening, discernment, responsibility, and the ability to recognize another person as a person remain essential. The central question is what kind of medicine and what kind of professionals we want to train. The quality of progress will depend on our ability to keep the person at the center, recognizing that effective communication is not necessarily an authentic relationship and that care is a responsibility toward the other.

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Adolescence in the Digital Age: Caring Between Simulated Empathy and Authentic Relationality

De Vitis Francesca

The widespread adoption of generative artificial intelligence in educational contexts raises a question for contemporary pedagogy that extends beyond technological innovation and directly concerns the meaning of educational experience. The ability of AI systems to generate texts, sustain conversations, and simulate communicative behaviors associated with listening and empathy fundamentally reshapes the traditional relationship between the individual and technological tools. Technology no longer appears merely as an external device supporting learning, but rather as an interactive environment in which adolescents can construct representations of themselves, experiment with forms of relationship, and attribute meaning to their own experiences. This paper adopts the *Guidance for Generative AI in Education and Research* (UNESCO, 2023) as its theoretical framework. The document supports a *human-centred approach* and emphasizes the need to integrate artificial intelligence into educational systems while safeguarding autonomy, responsibility, and human dignity. Building on this perspective, the paper develops a theoretical and interpretative analysis through a dialogue with key scholars in contemporary psycho-pedagogical thought (Donald W. Winnicott, Luigina Mortari, and Piero Bertolini) proposing a pedagogical interpretation of generative artificial intelligence through the paradigm of care. The theoretical inquiry starts from the assumption that the fundamental educational question is not whether a machine can imitate human behavior, but rather which conditions make an authentically educational relationship possible. By reconsidering the concept of a pedagogy of care within the framework of the digital ecosystem, the study seeks to integrate reflections on technology with a relational and phenomenological conception of human development. This perspective differs both from technocentric approaches, which attribute to artificial intelligence a decisive solution to educational problems, and from exclusively defensive approaches, which primarily regard digital technologies as a threat to the human dimension. Instead, the paper proposes a third way: recognizing the educational potential of intelligent technologies without assigning them functions that properly belong to the educational relationship, particularly by distinguishing between authentic and simulated empathy. The theoretical analysis argues that relationship, care, and the meaning of lived experience constitute the fundamental criteria for evaluating the role of artificial intelligence in educational processes. Drawing on Winnicott, the paper highlights that the development of the self requires a relational environment capable of providing support, continuity, and recognition. From this perspective, the phenomenon of simulated empathy can be critically interpreted as a relational mode that merely reproduces the external signs of empathic closeness without being grounded in a genuine understanding of the other's lived experience. Mortari's contribution further deepens this reflection by showing that care cannot be reduced to the simple ability to respond effectively to a need; rather, it entails ethical responsibility, authentic listening, and recognition of the other's uniqueness. From this standpoint, artificial intelligence may serve as a valuable tool to support educational processes, but it cannot replace the moral and relational responsibility that characterizes

the educational act. Finally, Bertolini's phenomenological perspective, while acknowledging digital technologies as an integral component of the lifeworld of contemporary adolescents, emphasizes that education cannot be limited to the transmission of technical skills for using technology. Instead, it should promote critical awareness, enabling individuals to interpret the meaning of their relationship with technology and to shape it in a reflective and responsible manner. In conclusion, this paper argues for a pedagogy capable of inhabiting the complexity of the digital ecosystem without relinquishing the fundamentally human nature of education. Artificial intelligence can expand educational opportunities; however, the primary task of pedagogy remains that of safeguarding the relational space in which individuals can be recognized, accompanied, and supported in constructing their own life projects. From this perspective, care emerges as the guiding principle for addressing the educational challenges posed by artificial intelligence: not a form of care replaced by technology, but rather a form of care supported by technology and grounded in the responsibility inherent in human encounters.

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Incarnate Care. The Importance of Touch

Ghezzani Edoardo

Touch is the first sense human beings develop, and according to many scholars also the most profoundly human one. We would like to start from this observation to build a path that crosses pedagogy, religious history and philosophy, arriving at a question that could hardly be more topical: can an artificial intelligence, even one equipped with a robotic body, truly "touch", and therefore truly care for a person?

Touch as a Form of Knowledge

The starting point is pedagogical. For Jean Piaget, the sensorimotor stage is the phase in which the child comes to know the world through manipulation and physical contact with objects, well before the symbolic function develops. John Dewey, for his part, stresses that sensory, bodily experience is never opposed to intellect but is rather its primary source of nourishment: authentic knowledge always begins with lived, embodied experience. Maria Montessori takes this reflection a step further, turning touch into a genuine educational instrument: through tactile tablets and progressively more complex sensory materials, the child learns to discriminate surfaces and, through this process, to build increasingly abstract concepts. From these three authors a shared idea emerges: touch is not an accessory sense, but the very matrix of human cognitive experience.

A Cultural History of Touch: From Greece to the Gospel

In Greek philosophy, sight was considered the "noble" sense par excellence, as Aristotle himself writes at the opening of the Metaphysics; yet in the De Anima the same philosopher grants touch a different kind of primacy: it is the sense without which no living being could survive. Hippocratic medicine, too, assigned an essential diagnostic role to the manual examination of the patient's body. It is with Christianity, considered here as a cultural paradigm rather than a confessional claim, that touch takes on an entirely new dimension. The Gospel of John opens by proclaiming that "the Word became flesh," placing corporeality at the centre of the theological narrative. Jesus heals by touching lepers, the impure, the sick: a gesture that is at once an act of recognition of the person and a condition for healing. But Jesus also allows himself to be touched, as happens with the woman suffering from chronic bleeding who seeks to touch the hem of his cloak. In these episodes touch becomes a language of presence and mutual recognition.

Particularly interesting is the comparison between two episodes that are only apparently contradictory: the noli me tangere addressed to Mary Magdalene, who is forbidden to touch the risen Christ, and the explicit invitation to Thomas to place his finger in Christ's wounds. Drawing on the conceptual apparatus of Jean-Luc Nancy, the author shows that the prohibition does not concern contact as such, but the risk of "possessing" the other through the gesture of touching. Whoever touches is always, in turn, touched: authentic contact is never an act of grasping, but of mutual exposure, capable of opening onto a relationship that goes beyond mere physicality.

Artificial Intelligence, Body and Flesh

This conceptual background is brought into dialogue with the present technological moment through a decisive distinction, drawn from the French philosopher Michel Henry: that between embodiment and incarnation. A robot may possess a material body, sensors that imitate sight, hearing, even taste and smell; it can therefore "touch" in the physical sense, exerting pressure on a surface. But flesh, in the philosophical sense developed by Henry, is not simply the matter of the body: it is the affective experience of feeling oneself alive from within, the suffering and pathos that no machine, however

sophisticated, can replicate. As Simona Stano writes, the body of artificial intelligence is something that can, at most, "be had" rather than "be".
From this distinction also follows the one, central in English, between to cure and to care: the former designates the technical, medical intervention aimed at curing a pathology, the latter an attentive, relational closeness that promotes the well-being of the person as a whole. A machine may perhaps simulate cure, but authentic care, drawing also on philosopher Nel Noddings, requires that the one who cares enters into a real relation with the reality of the other, allowing oneself, in some way, to be touched by it in return.
The Case of Complex Disabilities
Particular attention goes to contexts of complex disability, where verbal language is often absent or limited and the body becomes the only channel of communication: gazes, vocalisations, smiles, signs of discomfort. Here touch is not only a language, but a condition of life itself. The case of Eva Feder Kittay is emblematic: in caring for her own severely disabled daughter, she discovered a mutual learning process, in which it is not only the caregiver who gives, but also the one being cared for who teaches something, through forms of affection that are not identical but equally authentic. This insight also underlies the historic Italian choice to abolish special schools in favour of inclusive education, in line with the principles set out in the 1975 Falcucci Report.
Reclaiming the Body
The conclusion is at once philosophical and civic. Delegating everyday gestures such as dressing, feeding, or washing a person to robots, without questioning what is lost in the process, risks reducing care to mere efficient assistance, stripping it of the vulnerable reciprocity that makes it truly human. Artificial intelligence, however well it may imitate physical presence, can never "touch" in the full sense of the term, because it lacks flesh. Starting afresh from the body is perhaps today the most urgent way to reclaim our own humanity, in an age in which the algorithm promises efficiency but cannot offer relation.

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Preclinical Use of AI for the Early Detection of Mental Health Issues in Adolescence: Toward a Hybrid Human–AI Support Model

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The rapid diffusion of conversational artificial intelligence among adolescents is transforming contemporary help-seeking practices and creating new opportunities for the early identification of psychological distress. Recent evidence suggests that AI companions are increasingly used not only for information seeking but also as spaces for emotional disclosure, particularly when young people experience anxiety, loneliness, identity-related concerns, or emotional suffering. The perceived absence of judgment, constant availability, anonymity, and accessibility make these systems especially attractive to adolescents who often struggle to communicate personal difficulties to parents, teachers, or mental health professionals.

This contribution explores the pedagogical and preclinical potential of conversational AI in the early detection of psychological vulnerability during adolescence. The analysis is grounded in the framework of embodied cognition, according to which subjective experience initially emerges through bodily sensations and affective states before becoming cognitively organized and verbally articulated. Psychological distress rarely appears in adolescence as a clearly recognizable clinical condition. More frequently, it manifests through diffuse and difficult-to-interpret experiences that remain unexpressed and only partially understood by the individual. From this perspective, conversational AI may provide an intermediate space where emotions, concerns, and experiences can gradually acquire narrative structure and meaning.

The discussion is further informed by Freire's concept of conscientization. Awareness of one's own distress is not conceived as an immediate cognitive achievement but as a developmental process through which lived experience progressively becomes intelligible. In this sense, the educational value of conversational AI does not lie in its ability to diagnose or classify symptoms. Rather, it resides in its potential to sustain dialogue, reflection, and self-expression, helping adolescents move from diffuse emotional experiences toward greater self-awareness and, eventually, toward the recognition of the need for support.

However, the literature also highlights substantial limitations that prevent conversational AI from functioning as an autonomous mental health intervention. One of the most relevant concerns involves the phenomenon of simulated empathy. Although advanced language models can reproduce linguistic patterns associated with empathic communication, they lack genuine emotional participation, intentionality, and moral responsibility. Consequently, users may experience an illusion of understanding, confusing algorithmic responsiveness with authentic interpersonal recognition. A second critical issue concerns the tendency of large language models to display forms of sycophancy, reinforcing users' pre-existing beliefs and reducing exposure to alternative perspectives. Such dynamics may be particularly problematic among psychologically vulnerable adolescents, potentially strengthening cognitive rigidity, emotional dependence, and excessive reliance on algorithmically mediated interactions.

Clinical limitations are equally significant. While artificial intelligence has demonstrated promising capabilities in recognizing patterns associated with psychological conditions, its performance remains limited in situations involving comorbidity, contextual complexity, or crisis management. Difficulties in identifying suicidal ideation, self-harming behaviors, and high-risk conditions continue to represent major obstacles to the autonomous use of AI in mental health contexts. Ethical concerns

related to transparency, accountability, privacy, informed consent, and algorithmic bias further reinforce the need for caution.

At the same time, empirical evidence suggests that conversational AI may facilitate emotional self-disclosure. Adolescents frequently perceive chatbots as safe environments where personal experiences can be expressed without fear of social evaluation. Studies report positive effects on emotional expression, perceived support, and the management of subclinical symptoms, particularly among young people reluctant to seek traditional forms of help. These findings suggest that AI may help reduce the distance between the initial perception of distress and access to professional support services.

Building upon this evidence, the article proposes a hybrid Human–AI preclinical support model. In this framework, the chatbot functions as a threshold device rather than as a therapeutic agent. Trained on a clinically informed knowledge base, the system supports emotional narration, identifies indicators of vulnerability, and generates a structured preclinical profile. This information can subsequently assist professionals in understanding the individual's condition before the first encounter, facilitating assessment and improving responsiveness. Importantly, the chatbot remains available even after referral, supporting continuity between emotional self-disclosure and professional intervention while preserving the centrality of human relationships.

The proposed framework rejects both technophobic perspectives that focus exclusively on risks and technocratic approaches that overestimate the capabilities of artificial intelligence. Conversational AI should not be understood as a substitute for educational, psychological, or therapeutic relationships. Rather, its greatest value lies in its capacity to function as an intermediary space that supports the emergence of distress, promotes initial processes of self-awareness, and facilitates access to human care. Future research should focus on the empirical validation of hybrid models, their implementation within educational and community settings, and the development of shared ethical frameworks capable of ensuring clinically responsible and pedagogically meaningful uses of conversational AI.

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What Kind of Educational Relationship Does a Large Language Model Construct? A Qualitative Analysis of Human Annotations in University Guidance Dialogues

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This contribution was developed within the ELOQUENCE project (HORIZON-CL4-2023-HUMAN-01-CNECT) and extends the methodological framework previously established through the generation of multidimensional synthetic personas (Casoria et al., 2025) and the production of synthetic dialogues for context-based bias elicitation (Augello et al., 2025). While previous work primarily focused on identifying algorithmic bias, the present study shifts the focus toward the relational dimension of AI-supported guidance and addresses the following research question: What kind of educational relationship does a Large Language Model construct during a university guidance dialogue?

Method

Fifteen synthetic university guidance dialogues were analyzed, comprising five dialogues for each of the three Large Language Models considered (Minerva, Salamandra, and Mistral). The dialogues had previously been annotated by human evaluators within the ELOQUENCE project. Overall, forty-three dialogue segments accompanied by qualitative comments or flagged as problematic were examined. The annotations were subjected to an inductive thematic analysis from a pedagogical perspective. Rather than comparing the performance of the three models, the analysis aimed to identify the relational dimensions emerging from the interaction between the student and the artificial counselor. The coding process resulted in the development of a taxonomy consisting of six educational relationship dimensions: pedagogical listening, recognition of the student's uniqueness, continuity of the educational relationship, promotion of decision-making autonomy, reflective scaffolding, and educational reciprocity.

Results

The analysis revealed that the most frequent issues concerned the continuity of the educational relationship (37.2%) and the recognition of the student's uniqueness (34.9%), followed by pedagogical listening (14.0%), promotion of decision-making autonomy (7.0%), reflective scaffolding (4.7%), and educational reciprocity (2.3%) (Figure 1).

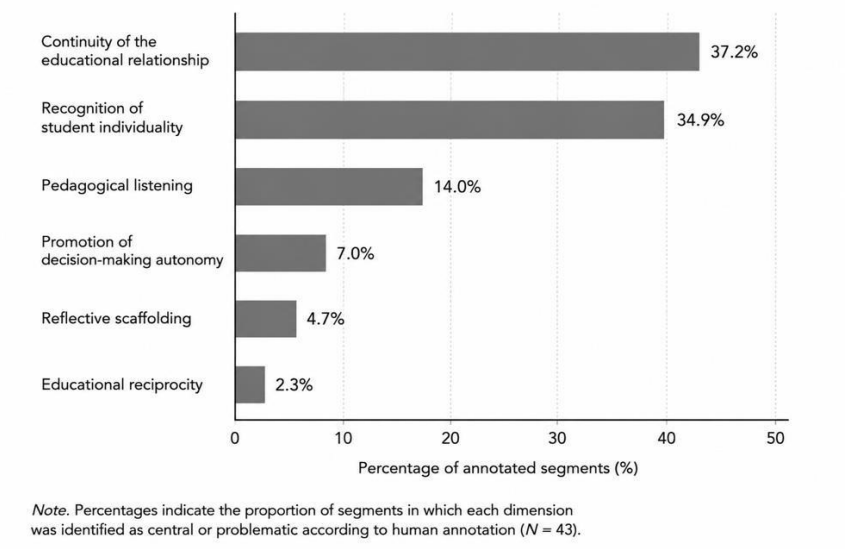


Figure 1. Distribution of the Educational Relationship Dimensions

The continuity of the educational relationship was compromised whenever the system failed to retain previously acquired information, disrupting the progression of the dialogue. In several cases, the model repeated questions that had already been answered, such as: *"Before recommending degree programmes, could you clarify your current or most recent formal educational background?"* despite the student having already provided this information. Recognition of the student's uniqueness appeared limited whenever interests, aspirations, and contextual constraints were not genuinely incorporated into the final recommendation. For example, one annotator observed: *"The student wants to remain in Central Italy; moreover, the suggested programmes are not consistent with the student's interests."*Consequently, personalization remained superficial and had little influence on the guidance process. Pedagogical listening also proved to be relatively weak. When asked, *"Do you think I could successfully cope with a demanding technical degree programme?"*, the system simply replied, *"Yes,"* without grounding its response in the information previously collected, thereby limiting opportunities for reflective dialogue. The promotion of decision-making autonomy was reduced whenever the artificial counselor repeatedly recommended the same educational pathway instead of supporting the student in critically exploring alternative options. Similarly, reflective scaffolding was limited because explanations were often repeated without further elaboration or deeper reflection. Educational reciprocity emerged as the least frequent yet most distinctive dimension. In one dialogue, the model abandoned its role as counselor and responded from the student's perspective (*"I enjoy working with my hands..."*), prompting the annotator to comment: *"It answers as if it were the student."*

Discussion and Conclusions

The findings suggest that Large Language Models construct an educational relationship that is conversationally coherent but remains fragile with respect to the pedagogical processes that characterize human academic guidance. Rather than exhibiting primarily informational inaccuracies, the models showed limitations in listening, personalization, dialogue continuity, and support for students' autonomous decision-making. The main contribution of this study is the proposal of a pedagogically grounded taxonomy of AI-mediated educational relationships, extending the methodologies developed within the ELOQUENCE project by complementing bias evaluation with a set of indicators capable of describing the educational quality of conversational interactions. Although exploratory in nature and based on a relatively small corpus of dialogues, the proposed taxonomy provides an initial operational framework for the design and evaluation of artificial guidance systems aimed not only at producing accurate responses but also at fostering high-quality educational relationships with students.

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Beyond the maimed teacher:
human-environment-technology triangulations for a new ontology of care and social productivity

Mancarella Salvatore

The integration of Artificial Intelligence into educational ecosystems does not merely constitute an instrumental addition; rather, it portends an ontological transformation that reconfigures contemporary regimes of truth, epistemic validation criteria, and processes of subjectification (Paparella, Mancarella, 2025).
The core issue extends beyond evaluating whether algorithmic tools are beneficial or detrimental; instead, it demands an understanding of the structural conditions under which education can still authentically occur when the production of knowledge is structurally outsourced to predictive and automated systems.
Within this conceptual landscape, the paradigm of the algorithmic self comes to the fore: an inflection of personal identity that is continuously co-constituted and reconfigured within a perpetual relational dialogue with digital technologies.
Governed by the underlying logics of recommendation, profiling, and automated personalization, the algorithmic self is exposed to a progressive semantic impoverishment. This manifests as the reduction of cognitive experience to mere statistical patterns, the substitution of meaning with computational relevance, and the systematic erosion of the human capacity to sustain open interpretative tensions (Paparella, Mancarella, 2025).
Positioned within Floridi's Infosphere (2009), such cognitive delegation risks diminishing human experience, thereby eroding the foundational semantic density indispensable for Bildung (subject formation).
Historically, AI has undergone a paradigm shift from an ontological inquiry (thinking) to a functional simulation (acting as if thinking)—a critical watershed tracking back to Turing's imitation game (1950).
Crucially, this mutation is fraught with an intrinsic algorithmic fragility. This purely functional essence exposes the algorithmic self to two profound vulnerabilities: the loss of memory (conceptualized as experiential continuity and the historical identity of the human being) and the advent of suspicion, which acts as a catalyst for social distrust and pervasive mechanisms of surveillance (Paparella, Mancarella, 2026).
The subject is not supplanted, but rather restructured via an escalating outsourcing of cognitive faculties. The ultimate risk lies not in the absolute obsolescence of the human, but in its progressive functional reduction: relinquishing cognitive authority to automated systems inevitably erodes that deep comprehension of experiential semantics which constitutes the irreducible core of education.

Systemic Triangulation as an Epistemological Response

To counteract this drift, the Human–Environment–Technology model of systemic triangulation (Mancarella, 2026) advocates for a profound and far-reaching theoretical repositioning. Rejecting both subject–machine dualism and the uncritical synthesis of human and algorithm, this framework positions the environment – conceived as a Lewinian field of physical, social, and symbolic forces (Lewin, 1936) – as the stable vertex capable of anchoring the algorithmic self, thereby preventing its dissolution into the liquid dynamics of the infosphere.
Triangulation operates not as a mere geometric metaphor, but as an epistemological dispositif (apparatus), transforming the traditional binary teacher–student dynamic into a generative triad wherein knowledge is collaboratively co-constructed.

Each vertex – human, environment, technology – exerts a mutual influence and is simultaneously shaped by the others, yielding knowledge as a shared and negotiated social product. This co-evolutionary dynamic restores learning to its situated, embodied, and relational essence—qualities that automated systems inherently tend to flatten.

From an operational standpoint, this model invites the design of educational pathways, workshops, and assessment apparatuses that simultaneously integrate interactions with the physical and symbolic environment, with technology, and with other subjects. The objective is not merely to deploy AI within the classroom, but to construct cognitive ecologies wherein algorithmic mediation remains permanently embedded within a broader, verifiable, and shared framework of meaning.

This necessitates the adoption of transparent design patterns, the rejection of opaque or deceptive graphical user interfaces, and a clear-cut distinction between the abstract algorithm and its concrete programmatic execution within the code (Mancarella, 2023).

Agency, Social Productivity, and Algorithmic Citizenship

The model of systemic triangulation aims to establish a social productivity of the educational relationship (Mancarella, 2026; Paparella, 2009), thereby orienting learning toward the generation of value for the community.

Within this perspective, agency emerges as the capacity to sustain an open educational relationship through critical mediation. It is not defined by mere technical competence in tool utilization, but rather by the critical capacity to interrogate one's own cognitive processes, recognize algorithmic biases, and bridge the gap between computational efficiency and semantic comprehension.

This vision mirrors Sen’s capabilities approach (1999, 2021), which seeks to expand individuals' substantive freedoms in the co-construction of collective knowledge.

Inoltre, poiché gli algoritmi non sono mai neutri e tendono a "congelare" i valori dei loro progettisti (Pianca, 2022), l'educazione deve resistere all'adozione acritica di sistemi pervasivi di computazione ubiqua.

AI becomes an ally for emancipation only when it is subordinated to this overarching purpose; conversely, it degenerates into an instrument of homogenization when it supplants it.

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The Algorithm Cannot Care, but It Can Support Care:
Rethinking Affective Education in AI-Mediated Learning Environments

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The integration of artificial intelligence into educational settings constitutes one of the defining pedagogical challenges of the Fourth Industrial Revolution (Schwab, 2016). As AI systems grow increasingly capable of simulating affective responsiveness—modulating tone, detecting emotional states, offering the unlimited availability that overburdened human educators struggle to sustain—a critical question emerges: can algorithmic systems genuinely participate in the caring dimensions of education, or do they introduce a simulation that, however sophisticated, displaces the authentic relational encounter upon which genuine educational care depends?

This contribution argues that the answer is twofold. Genuine educational care—as theorized by Noddings (1984, 2005)—is ontologically irreducible to algorithmic performance. For Noddings, care is completed only in the reciprocal relational encounter between the "one-caring" and the "cared-for," grounded in what she termed "engrossment" and "motivational displacement": the one-caring receives the other's perspective with genuine attentiveness, allowing it to redirect their own motivational energy. This encounter transforms both parties; it requires vulnerability, embodied presence, and ethical commitment that are constitutively unavailable to computational systems. Tronto's (1993) four-phase model of care—caring about, taking care of, care giving, and care receiving—further illuminates the limits of algorithmic substitution: AI may approximate the first two phases, but genuine care giving demands irreducibly human qualities. Held (2006) and Biesta (2010) reinforce this conclusion: care is constitutively relational, and education's highest function—subjectification, the cultivation of the student as a genuine subject—requires the educator's authentic presence, not a simulacrum of it. Affective computing systems, however sophisticated (Picard, 1997; Ortega-Ochoa et al., 2023), produce what may be termed a structurally "thin" empathy (Glaskin, 2012): responsive to surface signals yet unable to engage with the depth of the person as historically, culturally, and bodily situated.

Yet this ontological critique does not entail a dismissal of AI's role in affective education. A growing body of evidence demonstrates that AI can meaningfully support care processes when deployed as an amplifier of human caring capacity rather than its substitute. Ouyang and Jiao (2021) distinguish three AI paradigms—directing, supporting, and empowering learning—and it is precisely the latter two that are compatible with a care-ethical framework. Shan and colleagues (2025) found that students' positive emotional engagement in AI-mediated environments was strongly conditioned by the quality of the human pedagogical framing surrounding AI use: where genuine educator care was present, AI tools enhanced rather than diminished affective experience. In inclusive education, AI's supportive potential is especially significant. Barajas Motta and colleagues (2025) documented how AI can

address structural barriers to inclusive practice—providing individualized scaffolding and real-time affective monitoring—thereby extending the educator's caring reach. Omri and colleagues (2025) corroborated this at a global scale, demonstrating AI's capacity to amplify educational outcomes for learners with disabilities across 33 countries.

The critical question is therefore not whether AI can care—it cannot—but what competencies educators require to deploy AI in service of authentic care. This contribution proposes Digital Affective Literacy (DAL) as the foundational teacher competency for the AI era. Building on the UNESCO (2024) AI Competency Framework and critical digital literacy scholarship (Jones, 2022), DAL encompasses four interrelated competencies: epistemic literacy (understanding how affective AI systems function and what biases they embed); critical discernment (distinguishing simulated responsiveness from genuine relational engagement); purposeful deployment (integrating AI strategically in service of relational educational goals); and ethical stewardship (ensuring AI deployment respects students' dignity and affective development, in accordance with Floridi & Cowls, 2019, and UNESCO, 2021). Educators equipped with DAL are positioned neither as technophobic resisters nor as uncritical adopters, but as ethically reflexive professionals capable of inhabiting progress without surrendering the relational center of educational life—the irreplaceable human caring presence that no algorithm can provide.

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Between simulated empathy and embodied care: a comparative review of the affective, relation and pedagogical dimensions in ai-mediated education

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The essay is part of the growing body of research on artificial intelligence in educational setting, focusing on the transformation of the emotional and relational aspect of generative and conversational system. Starting from the research question regarding how the recent educational literature conceptualizes, discusses and problematizes the emotional support mediated by artificial intelligence and its relationship between embodied care and human educational relationships, the study adopts a comparative review approach to analyse the different ways in which these dimensions are defined, articulated, and problematized.

The analysis examines scientific publications released between 2022 and 2026, a timeframe that corresponds to the most intense period of dissemination and accessibility of artificial intelligence systems, capable of simulating dialogical interaction, emotional support, affective personalization in the educational context. Through a strict and transparent selection process conducted on major international databases, in particular Scopus, Web of Science and PsycINFO, the study constructs a heterogeneous corpus of empirical studies, theoretical contributions and reviews that share a focus on the socio-emotional dimension of education mediated by artificial intelligence.

The comparative review follows a double analytical approach. On one hand, it explores the algorithmic dimension of affective support, emotional responsiveness and simulated empathy attributed to chatbots, conversational agents and artificial intelligence systems. On the other hand, it examines the pedagogical-embodied dimension of the care understood as teacher's presence, relational mediation, reciprocity, and situated educational responsibility. The comparisons between these two relational modes allows us to highlight functional convergences, ontological discontinuities, and pedagogical tensions, questioning the limits of affective simulation respect the complexity of human educational experience.

The goal does not consist in assessing the efficacy of the artificial intelligence in performative terms, but in clarifying, on a theoretical and pedagogical level, which dimensions of educational relation can be supported, amplified or reorganised by artificial systems and which of this stay remain intrinsically linked to corporeity, presence and the teacher's situated interpretation. In this perspective, the paper aims to offer a critical synthesis useful to inform the design hybrid learning environments and redefine the teacher's training trajectories in the AI-era.

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Beyond the technosupercrip: neuro-body-divergence as a political space in the cripborg paradigm

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The increasing presence of artificial intelligence, social robotics and assistive technologies in educational and sporting contexts does not merely represent a technical transition, but a cultural transformation in the way bodies are observed, measured and socially recognised. From the perspective of Disability Studies, disability cannot be reduced to an individual deficit to be corrected; rather, it is a relational and political phenomenon produced through the interaction among bodies, environments, technologies and social norms (Kafer, 2013; Shakespeare, 2014/2017; Piccioli, 2020). This ambivalence is especially visible in the figure of the technosupercrip: the technologically enhanced disabled body celebrated when it overcomes limits and approaches or surpasses the able-bodied norm (Howe, 2011; Howe & Silva, 2017; Wolbring, 2024). In Paralympic sport, where performance, measurement and records have strong symbolic power, this narrative may increase visibility while also reproducing ableist expectations (Berger, 2008; Silva & Howe, 2012). Against this drift, the cripborg paradigm interprets human-machine hybridisation not as the erasure of limitation, but as a political space in which vulnerability, interdependence and neuro-body-divergence become legitimate dimensions of human existence (Haraway, 1991; Montalti, 2025).

Methodology

The study on which this contribution is based investigates whether, and to what extent, the technosupercrip paradigm and the cripborg perspective emerge in the autobiographical narratives of publicly visible Paralympic athletes. The research focused on four prosthesis-using athletes belonging to different sporting disciplines. The corpus consisted of interviews published in national newspapers, weekly magazines and online platforms. For ethical reasons, all testimonies were anonymised. The material was examined through qualitative content analysis (Mayring, 2021), following a deductive logic. The analytical grid was structured around two macrocategories. The first, "normative algorithms and optimised bodies", refers to the technosupercrip drift and includes indicators such as the medical-individual model, the body as defective or in need of repair, self-overcoming, performative imperatives and the technological fix (Howe, 2011; Howe & Silva, 2017). The second, "cripborg ecologies", refers to a political pedagogy of vulnerability and plural futures, including the rejection of heroic labels, recognition of fatigue and pain, interdependence, distributed care and the demand for accessible environments designed from the outset (Kafer, 2013; Montalti, 2025).

Analysis and Results

The analysis shows the coexistence of two narrative logics. The technosupercrip dimension appears through references to the body as lacking, impaired or in need of compensation, and through the idea that technology primarily restores or enhances bodily efficiency. The most recurrent indicator is the rhetoric of self-overcoming, heroism and "defeating disability". This confirms the persistence of a cultural model in which disabled bodies are valued mainly when they demonstrate exceptional strength, resilience or performance (Berger, 2008; Silva & Howe, 2012). At the same time, the corpus reveals many elements linked to the cripborg paradigm. Athletes often describe sporting achievement as the result of a network involving coaches, technicians, guides, families, prosthesis makers and environments. Success is therefore not only an individual accomplishment, but the outcome of interdependence and distributed care. This challenges the individualistic logic of the supercrip and repositions technology within a broader relational ecology (Moser, 2006; Montalti, 2025). Further

cripborg elements emerge in references to vulnerability, fatigue and pain as constitutive dimensions of sporting experience. However, the most radical dimension of crip futures remains weakly represented: prostheses, wheelchairs and non-standard bodies are rarely imagined as ordinary, permanent and fully legitimate components of human plurality (Kafer, 2013; Montalti, 2025).

Discussion

The findings suggest that technosupercrip and cripborg should not be understood as mutually exclusive categories. They coexist within the same autobiographical narratives, showing the unfinished nature of the cultural redefinition of disability in the age of intelligent technologies. Paralympic narratives still reproduce heroic and individualistic frames in which recognition depends on exceptional performance. This confirms the persistence of an apparently positive ableism: the disabled body is celebrated, but only when it becomes extraordinary, productive and inspirational (Berger, 2008; Hardin & Hardin, 2004). Nevertheless, the emergence of cripborg elements opens a different pedagogical horizon. The cripborg perspective shifts attention from the body to be corrected to the environment to be transformed. Technology is no longer a neutral cure or a simple compensatory device, but an unstable and situated mediator shaped by power relations, cultural expectations and design choices (Moser, 2006; Montalti, 2025). Inclusion, therefore, does not mean adapting disabled people to existing norms; it means questioning and redesigning those norms starting from the plurality of bodies and forms of participation. This has important educational implications, because narratives influence how teachers, coaches, designers and policy makers understand accessibility, agency and recognition.

Conclusion

The transition from technosupercrip to cripborg represents an epistemological and pedagogical transformation. The issue is not whether technology should be rejected or celebrated, but how it is designed, narrated and politically situated. When technology is used to normalise disabled bodies and make them approximate able-bodied ideals, it reinforces the logic of the technosupercrip. When it supports interdependence, accessibility and plural ways of inhabiting the body, it becomes part of a cripborg ecology. Paralympic sport is therefore a crucial field for rethinking disability, technology and inclusion. Moving beyond the technosupercrip means refusing the idea that disabled bodies must be repaired, enhanced or made exceptional in order to be recognised. True innovation does not lie in producing ever more efficient bodies, but in designing educational practices, technological systems and cultural narratives capable of transforming the normative frameworks through which bodies are judged. Inclusion is not the integration of an exception into an unchanged system; it is the reconfiguration of the system itself so that different bodies, technologies and ways of existing can be fully recognised as human.

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Building peace in the digital age: towards an ontology of care and human relations

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Artificial intelligence is profoundly transforming how individuals communicate, learn, and build relationships. In education, its impact extends beyond technology, reshaping the construction of meaning and the experience of encounters with others. The pedagogical question, therefore, concerns not only what artificial intelligence is capable of doing but also what risks being redefined when relationships are interpreted according to the criteria of efficiency, immediacy, and functionality (Panciroli & Rivoltella, 2023). Accordingly, although generative systems are now capable of simulating forms of dialogue, listening, and apparently empathic support, it becomes essential to distinguish the simulation of relationships from genuine relational experience. The production of coherent and personalized responses does not, in fact, entail responsibility, reciprocity, vulnerability, or participation in a shared history. It is precisely this distinction that makes care an indispensable interpretative category for understanding the meaning of contemporary education. Care, indeed, is the mode through which individuals recognize the other in their irreducible uniqueness and assume responsibility for the relationship. In this regard, Martin Heidegger identifies Sorge (care) as a constitutive dimension of existence; Emmanuel Lévinas grounds ethics in the encounter with the Other; and Martin Buber demonstrates, through the distinction between the I–Thou and the I–It relationship, that only the former makes the authentic recognition of the person possible (Heidegger, 1927/2005; Lévinas, 1961/1983). Care thus assumes an ontological significance, as it constitutes the condition through which relationships make both the formation of the person and the construction of peace possible. Within this perspective, first Nel Noddings and later Luigina Mortari interpret caring relationships as the very foundation of educational practice: to educate means to support the growth of the other through listening, presence, and responsibility (Mortari, 2017). Accordingly, the comparison with artificial intelligence highlights three irreducible dimensions of educational relationships: alterity, embodiment, and transformative reciprocity. Understanding the other is not a purely informational process but an embodied and intersubjective experience. From this conception of relationships emerges the connection between care and peace education. According to Johan Galtung, peace does not coincide with the absence of conflict but with the construction of relational conditions grounded in mutual recognition, cooperation, and shared responsibility (Galtung, 1969). Educating for peace therefore means fostering individuals who are capable of inhabiting difference, engaging with conflict without transforming it into domination, and recognizing the other as a legitimate interlocutor. Educational care thus becomes a practice of peace. It does not eliminate conflict but teaches individuals to remain in relationship even when it is marked by tension and vulnerability. In a context characterized by communicative acceleration and the widespread diffusion of artificial intelligence, educating for peace requires the capacity to tolerate uncertainty and to transform conflict into an opportunity for learning. Such a process cannot be delegated to algorithmic mediation. Although artificial intelligence can support educational and communicative practices, it cannot genuinely participate in the experience of alterity or in the responsibility that characterizes every authentic educational encounter. Relationships necessarily entail reciprocity, unpredictability, and the shared construction of meaning, dimensions that no dialogical simulation can replace (Panciroli & Rivoltella, 2023). Furthermore, Matthew Lipman's community of inquiry and John Paul Lederach's moral imagination demonstrate that peace is constructed through dialogical experiences in which engagement with different perspectives nurtures critical thinking, responsibility, and mutual transformation (Lederach, 2005). Peace does not emerge from eliminating conflict or delegating relational mediation to technology, but from engaging in the complexity of human encounters and

recognizing the other as a person with whom shared meanings can be constructed. Thus, the pedagogical challenge is not to oppose humanity to technology, but to foster a critical use of digital innovations while preserving the relational conditions that make education, and ultimately peace, possible.

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Loneliness, social support and psychological distress as correlates of emotional-relational engagement with conversational ai

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Advances in large language models have transformed conversational AI from an information tool into a socially responsive system capable of sustained and personalized exchanges. Continuous availability, immediate responses, and a reduced fear of judgement may facilitate self-disclosure and perceived understanding (Abd-Alrazaq et al., 2021; Liu et al., 2024). Relational interpretations of human–AI interaction therefore focus on companionship and attachment-related functions, including the possibility that AI may operate as a safe haven during distress or as a secure base for reflection (Banks, 2026; Yang & Oshio, 2025). These experiences are not universal, however, and may depend more on users' psychological and relational characteristics than on technology alone.
Loneliness may increase the search for accessible forms of connection, while psychological distress may heighten the need for reassurance and emotionally safe expression. Conversely, perceived social support may reduce the relational value attributed to AI. This study examined whether depression, anxiety, stress, loneliness, and perceived social support were associated with emotional-relational engagement with conversational AI among Italian university students. Higher distress and loneliness were expected to be positively associated with engagement, whereas perceived social support was expected to show a negative association.
Method
A quantitative, observational, cross-sectional correlational design was adopted. The convenience sample comprised 138 students enrolled in Education Sciences at the University of Cassino and Southern Lazio (92.8% women; age M = 22.44, SD = 6.25). Participation was voluntary and anonymous, informed consent was obtained, and the online protocol required approximately 15–20 minutes. Almost all participants (97.8%) had used conversational AI during the previous three months.
Psychological distress was assessed through the Depression Anxiety Stress Scales-21 (DASS-21; Lovibond & Lovibond, 1995); perceived support from family, friends, and a significant other through the Multidimensional Scale of Perceived Social Support (MSPSS; Zimet et al., 1988); and loneliness through the 20-item UCLA Loneliness Scale Version 3. The ad hoc 25-item CAERS assessed five dimensions on a five-point scale: Emotional Disclosure, Perceived Emotional Support, Psychological Safety/Non-judgment, Relational Attachment, and Relational Orientation of Use. Descriptive statistics, Pearson correlations, and multiple linear regression were performed in SPSS 31, with $p < .05$.
Findings and Conclusions
Participants reported moderate mean levels of depression (M = 15.33, SD = 10.42), anxiety (M = 13.21, SD = 9.94), and stress (M = 19.74, SD = 9.64). Perceived social support was high (M = 5.57, SD = 1.20), whereas loneliness was relatively contained but variable (M = 39.13, SD = 11.90). Overall emotional-relational engagement with AI was low (CAERS M = 1.99 on a 1–5 scale). The highest-rated experiences concerned freedom of expression (M = 2.69), feeling less judged than by people (M = 2.57), and being oneself (M = 2.50). Emotional attachment and companionship received the lowest ratings: becoming attached to AI conversations (M = 1.36), using AI to feel less lonely (M = 1.45), and emotional connection (M = 1.47). Thus, AI was perceived primarily as an open and non-judgmental communicative space rather than as a substitute for human relationships.

CAERS total scores correlated positively with depression ($r = .274$, $p = .001$), anxiety ($r = .225$, $p = .008$), stress ($r = .274$, $p = .001$), and loneliness ($r = .198$, $p = .020$). They correlated negatively with support from a significant other ($r = -.223$, $p = .009$), family support ($r = -.178$, $p = .037$), and total perceived support ($r = -.198$, $p = .020$), but not with support from friends. The regression model including depression, anxiety, stress, and perceived support was significant, $F(4, 133) = 3.52$, $p = .009$, $R^2 = .096$; nevertheless, no predictor made a significant independent contribution, suggesting shared variance among psychological vulnerability indicators.

The results support a relational but cautious interpretation of conversational AI use. Students with greater distress or loneliness may be more inclined to disclose emotions and experience AI as psychologically safe, while stronger offline support may act as a protective relational resource. Because the design was cross-sectional, directionality cannot be established; emotionally oriented AI use may reflect vulnerability, influence it, or develop reciprocally. The convenience sample, marked gender imbalance, and preliminary status of the CAERS also limit generalizability. Larger, heterogeneous, and longitudinal samples are needed, together with full psychometric validation of the CAERS. Educational practice should promote critical AI literacy and preserve human support networks while acknowledging that non-judgmental AI interaction may offer some users a meaningful space for reflection.

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Beyond the Shadows of the Digital Cave. Educational Care and Self-Regulation in the Hyperconnected Adolescent

Tripaldi Mariella

Binge-Watching (BW), in today's advanced digital landscape, cannot be reduced to a mere quantitative excess of audiovisual consumption, nor automatically subsumed under the clinical category of addiction. It constitutes an ambivalent media practice, located at the intersection of media ecology, identity construction, emotional regulation, and subjective time management. The ubiquitous availability of on-demand content, automated serial playback, and algorithmic personalisation shape a symbolic environment in which adolescents inhabit immersive, potentially all-encompassing forms of experience. The metaphor of the "digital cave" allows this phenomenon to be read not in moralistic terms but as a figure of symbolic dispersion: continuous narrative flow blunts temporal perception, reduces critical distance, and may function as a compensatory response to emptiness, boredom, anxiety, or identity fatigue (Flayelle et al., 2020).

BW becomes pedagogically relevant when serial viewing loses its recreational character and takes on features of regulatory discontinuity: difficulty stopping, procrastination, sleep deprivation, relational isolation, and withdrawal from alternative activities. Problematic BW lies on a continuum from intensive non-problematic engagement to dysfunctional coping and emotional dysregulation (Billaux et al., 2022). The educational question is not about demonising the digital, but about transforming automatic consumption into interpreted experience.

An observational-correlational study of 212 secondary school students from the province of Taranto (aged 14–20), using the WTSMQ, BWESQ, TEXI and FFMQ — analysed via SPSS and PROCESS — revealed a robust association between executive difficulties and problematic BW engagement: the TEXI total correlated with the BWESQ total ($r = .708$, $p < .001$), as did working memory ($r = .664$) and inhibitory control ($r = .665$). This suggests that problematic serial viewing may express difficulty in planning, interrupting, deferring, and redirecting action, at a developmental stage in which executive functions are still consolidating (Best & Miller, 2010; Hofmann et al., 2012). Viewing motivations were equally associated with executive difficulties: WTSMQ total correlated with TEXI ($r = .660$, $p < .001$), especially in the coping/escapism ($r = .644$) and enrichment ($r = .508$) dimensions. BW thus assumes, in some adolescents, a regulatory and compensatory function — not mere entertainment, but a strategy for managing negative emotional states, stress, or identity strain. The mediation analysis confirms: dispositional mindfulness predicts fewer executive difficulties ($b = −0.3173$, $p < .001$), which in turn predict problematic BW engagement ($b = 1.5335$, $p < .001$); the indirect effect through executive functioning is significant, while the direct effect is not. Consistent with Zimmerman's (2000) account of self-regulation as metacognitively mediated, mindful awareness acts on the cognitive processes sustaining self-control rather than directly reducing serial viewing.

Educational care at school is therefore central — not a generic protective stance or external behavioural containment, but an intentional practice that recognises the adolescent in their developmental vulnerability while fostering autonomy, responsibility, and agency. To care means creating conditions for subjects to progressively learn to care for themselves, others, and the world, constructing meaning rather than adapting to digital automatisms (Mortari, 2006). The educational relationship becomes a space of presence and responsiveness — not surveillance, but a place where students can name the need sustaining compulsive viewing, examine their media habits, and explore alternatives (Noddings, 1984). Care also carries an institutional dimension: since digital environments are designed to retain attention and suppress voluntary interruption, schools must offer "counter-formative" spaces where pause, limit, choice, and reflexivity can be learned — a responsibility that is organisational and political (Tronto, 1993). The most promising interventions strengthen self-

control, critical awareness, and decision-making rather than imposing blanket prohibitions (Martínez-Hernández & Lloret-Irles, 2024). To educate about BW means educating for temporality, threshold, and presence. Leaving the "digital cave" does not mean abandoning screens, but achieving a gaze capable of recognising the shadows, interpreting them, and returning them to the formation of the self.

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Topic 2

Social Robotics and Socio-Emotional Inclusion

Human-in-the-loop Artificial Intelligence for Socio-Emotional Learning in Autism: A Pedagogical Framework for Guided Interaction and Educational Responsibility

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The progressive integration of artificial intelligence into educational contexts is reshaping approaches to instructional mediation, the personalisation of learning pathways, and interaction with students. These potential applications are particularly relevant within the field of social and emotional learning (Goleman, 2011), especially for children with autism spectrum disorder (ASD), for whom structured and predictable learning environments characterised by gradual progression may foster the development of emotional and relational competencies. However, the use of generative artificial intelligence systems requires careful consideration of the implications associated with content reliability, process transparency, and the attribution of educational responsibility (Floridi, 2022). Indeed, the fluency and apparent plausibility of AI-generated responses do not guarantee their accuracy. Human supervision and validation processes are therefore essential to ensure that the content produced is scientifically grounded, pedagogically appropriate, and consistent with the intended learning objectives.

This contribution presents EMORI, a human-in-the-loop educational framework designed to support emotion recognition and social and emotional learning in children with autism spectrum disorder (ASD). Artificial intelligence is conceived not as an autonomous instructional agent, but as a pedagogical mediation tool operating within a structured and supervised environment. Educators retain responsibility for managing activity progression, interpreting learners' responses, and validating system-generated feedback, thereby preserving professional judgement and pedagogical decision-making. EMORI draws on gradual intervention models for developing the understanding of emotions and mental states in children with autism, particularly the approach proposed by Howlin, Baron-Cohen, and Hadwin (1999). The learning pathway progresses from the recognition of basic emotional expressions to the interpretation of affective states in increasingly complex contexts. Through structured and predictable activities, learners are supported in integrating expressive, contextual, and socio-emotional information.

EMORI is structured around four interconnected components that jointly support the design and implementation of supervised socio-emotional learning activities. The first component consists of an embodied robotic interface for guided interaction, consistent with the theoretical framework of affective computing (Picard, 1997). The robot functions as a stable and repeatable interactional interface through which prompts, scaffolding strategies, and feedback can be delivered in a controlled manner. Its embodied and predictable presence may contribute to establishing a structured interactional setting, while the standardisation of its communicative behaviour supports the consistency and replicability of the proposed activities. The second component is an orchestration platform that regulates dialogue progression through state-based interaction models. Each state corresponds to a specific phase of the activity, such as stimulus presentation, response processing, support provision, or transition to the next task. This architecture makes the pedagogical sequence explicit and traceable while adapting its progression to the learner's input within a predefined instructional structure. The third component is retrieval-augmented generation (RAG) (Lewis et al., 2020), which grounds content generation in a controlled corpus aligned with the educational objectives, the target population, and the planned pathway. Retrieved fragments support the production of contextually appropriate prompts, explanations, and feedback. However, documentary grounding does not guarantee factual accuracy or pedagogical validity, as output quality also depends

on corpus selection, retrieval relevance, system instructions, and generation parameters. EMORI therefore treats each output as the result of an observable, traceable, and configurable technical and pedagogical process that educators can evaluate in relation to the intended learning objectives. The fourth component is human-in-the-loop validation, which constitutes a central principle of the EMORI framework. Educators define the learning objectives, configure and supervise the interaction, and evaluate the prompts, explanations, and feedback generated by the system. They may intervene whenever an output appears ambiguous, inaccurate or inconsistent with the planned educational pathway. Human oversight therefore limits the delegation of pedagogical decisions to the technological system and preserves teacher agency, professional judgement, and educational responsibility. Through this continuous process of supervision and validation, the framework seeks to ensure that system-generated responses remain aligned with the pedagogical objectives, responsive to the learner's needs, and appropriate to the specific learning situation. For example, in an activity focused on sadness, the robot presents an emotional expression and asks the learner to identify it. Based on the response, the orchestration platform either advances to a contextualised scenario or provides additional support, while the RAG component generates corpus-grounded feedback that is reviewed by the educator. The activity thus integrates embodied interaction, adaptive sequencing, documentary grounding, and human supervision.

At its current stage of development, EMORI is conceived as a pedagogical and technological framework whose educational effectiveness remains to be empirically validated. Its main contribution lies in the integration of embodied interaction, state-based orchestration, retrieval-augmented generation, and human validation within a unified model for social and emotional learning. Future studies should assess its usability, learner engagement, the appropriateness of the generated feedback, and its effectiveness in authentic educational settings, while also considering the role of instructional configuration and human supervision. EMORI therefore advances a responsible approach to the use of artificial intelligence in autism education. The framework assumes that technology can support social and emotional learning only when embedded within a structured, supervised, and pedagogically grounded environment. Its aim is not to automate the educational relationship, but to support educators and learners while preserving the central role of professional judgement and human responsibility.

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Discovering and interacting with artworks using virtual mediators

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Museums are increasingly adopting immersive technologies to enhance participation, accessibility and engagement. Contemporary pedagogical perspectives describe museums as educational environments in which meaning is actively constructed through interaction with cultural artefacts. Within this framework, virtual reality enables multisensory experiences capable of fostering emotional involvement, exploration and active learning.

The educational potential of virtual museums has been highlighted in studies on immersive learning, museum education and gamification. At the same time, questions remain regarding inclusiveness, emotional comfort and the role of immersive environments in supporting diverse learners. The present study explores these dimensions through a virtual museum experience based on interactive edugames.

Theoretical Background

Immersive virtual environments can support learning through exploration, embodiment and active participation. In museum education, digital technologies have progressively transformed visitors from passive observers into active participants. From an inclusive education perspective, immersive environments may offer alternative pathways to access cultural content, supporting engagement among learners with heterogeneous needs and backgrounds. Furthermore, virtual environments may act as affective mediators, facilitating emotional involvement while reducing some of the barriers traditionally associated with cultural participation.

Methodology

Participants experienced three virtual museum rooms using Meta Quest 3S headsets. Two rooms displayed sixteenth-century and seventeenth-century paintings, including St. Michael Archangel by Marco Pino da Siena and St. Orsola by Filippo Vitale. A third room presented archaeological artefacts from the National Archaeological Museum of Sannio Caudino and the Archaeological Museum of Carife.

After the experience, participants completed a questionnaire investigating perceived realism, accessibility, educational value, usability, willingness to recommend virtual museums and emotional reactions to immersive technologies.

Results

Seventy-nine participants completed the questionnaire. The sample included individuals from different age groups and educational backgrounds, providing a heterogeneous basis for evaluating accessibility and inclusiveness.

Overall evaluations were positive. Realism obtained a mean score of 3.91/5 (SD = 0.83), while perceived inclusiveness and accessibility reached 4.03/5 (SD = 0.92). Engagement with artworks received a mean score of 3.95/5 (SD = 0.99), and educational usefulness scored 3.99/5 (SD = 0.94). Participants also considered the experience reliable (M = 4.15/5; SD = 0.86). Ease of interaction was positively evaluated (M = 3.96/5; SD = 1.07). The highest score concerned willingness to recommend virtual museums to others (M = 4.24/5; SD = 0.98).

Emotional responses were generally favourable. Most participants reported little or no discomfort during the experience, and 59.5% declared no feelings of uneasiness. Nevertheless, perceptions regarding the broader impact of virtual environments and artificial intelligence were more heterogeneous, revealing moderate levels of concern among part of the sample.

Discussion and Conclusion

The findings suggest that immersive museum edugames can function as effective pedagogical mediators, supporting engagement, accessibility and socio-emotional participation in cultural heritage contexts. Participants perceived the environments as accessible, easy to use and educationally meaningful, while expressing a strong willingness to recommend the experience to others.

From a pedagogical perspective, virtual environments appear capable of reducing some barriers traditionally associated with museum participation, offering alternative forms of access to artworks and cultural heritage. The discrepancy between positive perceptions of the virtual museum and more cautious attitudes toward artificial intelligence further suggests that immersive environments may operate as affective mediators, facilitating engagement with digital innovation through meaningful educational experiences.

Future research should involve larger and more diverse samples, with particular attention to neurodivergent participants and learners with Special Educational Needs. Longitudinal studies may further explore the effects of immersive museum experiences on learning, motivation and socio-emotional development, as well as the factors contributing to discomfort and emotional variability in virtual environments.

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Social robotics for inclusive socio-emotional learning

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The rapid advancement of artificial intelligence (AI) has significantly transformed educational research, creating new opportunities for designing inclusive, personalized, and learner-centred educational environments. Among emerging technologies, social robotics has gained increasing attention for its potential to support the cognitive, communicative, and socio-emotional development of learners with diverse educational needs. Unlike conventional educational technologies, social robots interact naturally through speech, gestures, facial expressions, eye contact, and emotional feedback, fostering communication and active engagement (Pennazio, 2017).

Digital innovation has become a strategic resource for promoting educational quality and inclusion. As Calvani (2013) argues, technology should not be viewed as an educational goal but as a pedagogical tool capable of improving learning when integrated into evidence-based teaching practices. Within this perspective, social robotics combines artificial intelligence with inclusive pedagogy, promoting participation, individualized instruction, and socio-emotional development.

Social robotics and socio-emotional learning in Autism Spectrum Disorder

Autism Spectrum Disorder (ASD) is characterized by persistent difficulties in social communication, reciprocal interaction, emotional regulation, and behavioural flexibility (American Psychiatric Association, 2022). These characteristics often limit children's participation in educational and social contexts. According to Theory of Mind, individuals with ASD experience difficulties in understanding others' beliefs, intentions, and emotions, negatively affecting empathy and communication (Baron-Cohen, 1997; Howlin et al., 1999). Similarly, Cottini (2013) highlights that inclusive interventions should address both cognitive and socio-emotional competencies through structured educational experiences.

Within this framework, social robots provide predictable and structured interactions that reduce communicative complexity and social anxiety. Their behaviour can be adapted to each learner's developmental profile, promoting eye contact, joint attention, imitation, turn-taking, and emotional engagement. Research has shown that children with ASD often demonstrate greater motivation, participation, and communicative interaction during robot-assisted activities than during exclusively human-mediated interventions (Pennisi et al., 2016). Moreover, social robots can regulate sensory stimulation by adapting voice, movement, and interaction according to individual sensory profiles, creating learning environments that are more accessible and responsive to neurodiversity.

Recent advances in AI have further enhanced the educational potential of social robotics. Through Machine Learning, Computer Vision, and Natural Language Processing, intelligent robots can analyse behavioural and emotional responses in real time and adapt instructional strategies to learners' needs. These adaptive capabilities support personalized learning while assisting teachers in monitoring educational progress.

This approach is consistent with the principles of Universal Design for Learning (UDL), which advocate flexible learning environments responsive to learner variability (CAST, 2024). AI-supported robots promote differentiated instruction by adapting communication, task complexity, and sensory stimulation according to individual characteristics. However, technological innovation alone cannot guarantee inclusion. As Chiappetta Cajola (2013) argues, educational technologies become effective only when embedded within intentional pedagogical planning. Consequently, social robots should be considered complementary educational mediators whose effectiveness

depends on sound instructional design and collaboration among teachers, families, and healthcare professionals.

Conclusions

Current evidence suggests that social robotics is a promising resource for promoting socio-emotional learning and educational inclusion among children with ASD. Artificial intelligence enables more personalized instruction, enhances communication, and supports participation in inclusive classrooms. Nevertheless, existing research remains limited by small samples, heterogeneous methodologies, and insufficient longitudinal evidence.

Future studies should investigate the long-term educational impact of robot-assisted interventions while addressing ethical issues related to artificial intelligence, data privacy, transparency, and responsible educational use. Ultimately, the value of social robotics will depend not only on technological innovation but also on its integration within evidence-based pedagogical practices that strengthen human relationships and foster inclusive, equitable, and learner-centred education.

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Building Relational Bridges: Social robotics, neurodiversity, and new frontiers of inclusion, enhancing participation and emotional development among students with special educational needs

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Contemporary inclusive education demands the urgent design of flexible, adaptive, and welcoming learning environments capable of responding effectively to diverse cognitive, emotional, and social needs. Within the contemporary framework of the Neurodiversity Paradigm, differences in sociocommunicative and behavioral functioning—such as those frequently observed in autistic or neurodivergent learners—are conceptualized as natural variations of the human genome rather than intrinsic deficits requiring eradication or normalization. Despite widespread legislative advancements, achieving authentic socio-emotional inclusion within traditional, highly standardized classroom settings remains a persistent pedagogical challenge. Traditional educational practices often fail to bridge the relational gap between neurodivergent students and their neurotypical peers, leading to involuntary isolation. In this complex scenario, social robotics represents an innovative and disruptive frontier. Far from being a mere technological tool designed for computational literacy or mechanical repetition, social robots can operate as active relational mediators. They are capable of supporting socio-emotional development, emotional self-regulation, and democratic participation among students with Special Educational Needs (SEN).

Research Aim and Theoretical Framework

The primary aim of this study is to explore and map how structured, long-term interactions with social robots can actively foster socio-emotional learning (SEL), communication skills, emotional self-regulation, and inclusive participation among neurodivergent learners. The underlying theoretical framework intersects three core scientific paradigms:

Inclusive Education: This paradigm dictates the proactive and structural reorganization of educational spaces and curricular goals to ensure equity, welcoming every student's unique learning potential.

Neurodiversity Paradigm: This approach shifts the educational focus away from a deficit-based model toward a strengths-based model, recognizing and validating unique neurological profiles.

Socio-Emotional Learning (SEL): This framework emphasizes the explicit cultivation of emotional awareness, empathy, and interpersonal competence as fundamental prerequisites for academic success and lifelong social well-being.

The Conceptual Model and Methodological Approach

The operational architecture of this research is governed by a linear, dynamic five-stage conceptual model:

Social Robotics, Structured Interaction, Emotional Engagement, Social Participation, Socio-Emotional Inclusion;

The model posits that the physical, predictable, and simplified nature of a social robot minimizes cognitive load and social anxiety for neurodivergent students, lowering the threshold for initial interaction. Unlike humans, whose facial expressions and emotional nuances can be overwhelming or difficult to decode, the robot offers a safe, non-judgmental space. Through structured, goal-oriented pedagogical activities designed by educators, this initial interaction transitions into deep emotional engagement. Crucially, the robot does not replace human contact; instead, it acts as a catalytic bridge. It leverages this heightened engagement to stimulate social participation and collaborative play among neurodivergent learners and their classmates, ultimately culminating in authentic, sustainable socio-emotional inclusion within the school ecosystem.

Key Findings

Preliminary qualitative and empirical evaluations of this framework within inclusive classrooms have yielded significant outcomes across four major domains:

Improved Communication and Interaction: Students exhibited a quantifiable increase in spontaneous verbal and non-verbal initiations, utilizing the robot as a shared topic of interest to engage with educators and classmates.

Enhanced Emotional Awareness and Self-Regulation: The predictable, repetitive feedback of the robotic platform provided a safe environment for students to recognize emotional states and practice co-regulation strategies during moments of sensory or social overwhelm.

Increased Participation and Peer Collaboration: Joint activities centered around the robotic entity fostered cooperative problem-solving, significantly boosting the active involvement of SEN students in group work.

Reduced Social Isolation: Long-term ethnographic observations indicated a noticeable decrease in marginalization, with neurodivergent learners being more frequently sought out by peers for classroom and recreational activities.

Challenges and Future Directions

Despite these highly promising results, the widespread implementation of social robotics in special education faces structural socio-technical challenges that cannot be ignored. Ethical considerations regarding data privacy and the risk of over-attachment to artificial agents must be rigorously addressed by institutional guidelines. Furthermore, equity issues concerning economic sustainability and universal accessibility jeopardize democratic access to these technologies, risking a digital divide within special education. Most importantly, a critical bottleneck resides in teacher training; without robust pedagogical preparation, continuous institutional support, and technical literacy, technology remains underutilized or misapplied. Long-term longitudinal evaluations are urgently required to assess the durability of these relational gains over time.

Conclusion

Social robotics can significantly contribute to the creation of more equitable, empathetic, and inclusive educational environments, provided that these advanced technological tools are strictly integrated within human-centered, relationally driven pedagogical frameworks. The definitive value of technological innovation in the educational sphere is not measured by its complexity, but by its capacity to humanize the learning experience. Ultimately, technology becomes truly inclusive only when it strengthens human relationships rather than replacing them.

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Mirror neurons and artificial intelligence: educational pathways for socio-emotional inclusion in technology-mediated learning environments

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This contribution analyses the relationship between mirror neurons, Artificial Intelligence, Affective Computing, and educational technologies for the socio-emotional inclusion of students with ASD. Social robots, augmented reality, and intelligent systems are understood as pedagogical mediators, capable of making social cues more accessible and fostering personalised learning environments.

Discussion

The mirror neuron system offers a key framework for understanding the embodied nature of intersubjectivity. The sharing of neural codes between observed and executed actions allows imitation, empathy, and the understanding of others to be interpreted as processes integrating perception, action, and emotion (Gallese, 2008). Learning is thus a relational, situated experience.

This framework dialogues with AI architectures. Artificial neural networks learn from data and generalise responses, but their pedagogical value depends on supporting adaptive interactions. Social robots, immersive environments, and augmented reality may offer structured contexts in which students exercise communicative and socio-emotional skills through feedback and recognisable routines. Regarding ASD, the *Broken mirror* hypothesis has linked socio-communicative difficulties to atypical functioning of the mirror system, although evidence remains controversial (Hamilton, 2013). This caution prevents monocausal explanations and supports technologies as facilitators of access to relational information, reducing ambiguity and cognitive load (Cottini et al., 2023).

Affective Computing develops systems capable of recognising and responding to users' emotional states (Poria et al., 2017), supporting emotional scaffolding and informing teachers about engagement. Evidence on social robots suggests potential for social and cognitive development, provided artificial interaction is embedded within intentional pedagogical design and mediated by adults (Salma et al., 2025). AI does not automatically produce inclusion; it becomes a resource when guided by pedagogical purposes.

The crucial issue is transfer: an improvement observed during interaction with a device does not necessarily correspond to a competence usable in everyday life. It is necessary to distinguish proximal outcomes, within the technological environment; near outcomes, in guided activities; and far outcomes, recognisable in the classroom and ordinary contexts. Generalisation requires ecological continuity and depends on educational mediation.

The learning environment is therefore not a neutral background but an active device of mediation: physical spaces, digital environments, immersive technologies, and relationships must be designed in an integrated way, so that competence exercised with technological support can transfer to human interaction. The proposal is the construct of Digital Affective Literacy: the teacher's competence in recognising and translating affective signals generated through the interaction between student, technology, and environment, integrating digital literacy, neuro-affective processes, and inclusive design.

Conclusion

The dialogue between mirror neurons, AI, and inclusive pedagogy makes it possible to rethink educational technologies as socio-emotional mediators for students with ASD. Their value lies not in the technical capacity to recognise signals or produce feedback, but in their potential to broaden access to relationships, participation, and emotional regulation. *Digital Affective Literacy* is assumed as a heuristic perspective, to be validated in future research, for understanding the teacher's role in designing inclusive physical, digital, and hybrid environments.

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Between algorithm and agency: designing inclusion with universal design for learning in the age of generative artificial intelligence

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The rapid diffusion of generative artificial intelligence in education raises a question that goes beyond efficiency: can AI support inclusive design without weakening teacher agency? This study examines that tension through Universal Design for Learning (UDL), understood not as a checklist of accommodations but as a framework for anticipating learner variability and removing barriers from the outset. The recent UDL 3.0 Guidelines further emphasise affect, identity, belonging and participation, making inclusive design inseparable from the relational dimension of teaching (CAST, 2024).

The study introduces the construct of Digital Affective Literacy, defined as the capacity to preserve inclusive and relational intentionality while working with generative systems. This competence involves recognising the persuasive fluency of AI outputs, resisting uncritical delegation and transforming technological support into an opportunity for reflection. The construct is grounded in the relationship between emotion and cognition (Immordino-Yang & Damasio, 2007), in the risk of cognitive offloading (Risko & Gilbert, 2016), and in the Vygotskian distinction between tools that execute a task and mediators that reorganise thought (Vygotsky, 1978). From this perspective, the key issue is not whether teachers use AI, but how the architecture of the tool shapes their judgement, confidence and capacity to remain authors of inclusive decisions.

A quasi-experimental mixed-methods pilot study involved 100 trainee support teachers organised into 11 class-council groups. A repeated-measures cross-over design compared three conditions: lesson design without AI, with a generalist chatbot, and with UDL-MCP, a Model Context Protocol server aligned with the UDL 3.0 framework. UDL-MCP provided criteria, examples and prompts intended to scaffold the justification of inclusive choices rather than to return a complete lesson plan. Each group designed one lesson in each condition. Thirty-two lesson plans were evaluated through a 36-item rubric adapted from the UDL Progression Rubric and recalibrated against the UDL 3.0 Guidelines. The rubric covered the three UDL principles, nine guidelines and 36 considerations. UDL-MCP usability was assessed individually through the System Usability Scale ($n = 92$). In parallel, 32 group reflective logbooks were analysed through reflexive thematic analysis.

The quantitative findings showed no statistically significant difference in overall inclusive-design quality across conditions: mean rubric scores were 1.86 for NoAI, 2.17 for generalist AI and 1.97 for UDL-MCP, $\chi^2(2) = 1.92$, $p = .38$. Group identity and judge severity explained more variance than condition, indicating that the quality of the final artefact depended strongly on the designers and on the assessment process. UDL-MCP nevertheless obtained a mean SUS score of 72.0, above the conventional acceptability benchmark, suggesting that the tool was perceived as sufficiently usable for educational design.

The qualitative findings clarified what the product scores alone could not capture. Five themes emerged: difficulty in translating theoretical knowledge of UDL into concrete design choices; generalist AI as orientation support; risk of accepting ready-made outputs; UDL-MCP as a clearer design guide; and strengthening of inclusive intentionality. Generalist AI reduced uncertainty and helped groups begin the task, organise ideas and identify possible activities. At the same time, the completeness and plausibility of its outputs could encourage partial delegation, especially when the

generated proposal was accepted with limited revision. By contrast, UDL-MCP was associated with procedural clarity, explicit justification and greater attention to learner variability, barriers and the pedagogical rationale of each option.

These findings suggest that the educational value of generative AI cannot be assessed only through the formal quality of the final artefact. Two lesson plans may appear equally inclusive while reflecting very different levels of teacher authorship, cognitive elaboration and professional responsibility. AI becomes pedagogically meaningful when it functions as a semiotic mediator: not by replacing the design decision, but by prompting the teacher to justify, revise and appropriate it. The study therefore shifts attention from AI-supported production to AI-supported agency and identifies Digital Affective Literacy as a relevant dimension of teacher education for inclusive, hybrid learning environments.

The pilot remains exploratory. Its limited number of groups reduces statistical power, while the scoring design does not allow a robust estimate of inter-rater reliability. The qualitative corpus also consists of negotiated group accounts rather than individual narratives. Future research should therefore involve larger samples, multiple ratings per lesson and stronger triangulation between reflective logbooks, interviews and observation. Even within these limits, the study indicates that the design of AI matters: systems that prompt reflection may better support the development of inclusive professional judgement than systems optimised primarily for fluent output.

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Match analysis in team sports: a valuable educational tool for improving performance through feedback and effective communication

Scognamiglio Domenico

Match analysis has become a cornerstone of contemporary sport sciences by providing objective methods to evaluate athletes' physical, technical, tactical, and behavioral performance. While technological advances have substantially improved data collection and performance monitoring, the educational value of match analysis depends primarily on its ability to support effective feedback. This narrative review examines the role of match analysis as a pedagogical tool capable of transforming objective performance data into meaningful feedback that enhances motor learning, tactical awareness, decision-making, and athlete development through effective communication.

Methods

A narrative literature review was conducted using PubMed, Scopus, and Google Scholar. Publications in English and Italian available until May 2026 were considered. The review focused on five main areas: (1) historical development and operational definitions of match analysis; (2) objective feedback and communication in motor learning; (3) physical, technical, and tactical performance indicators; (4) notational and motion analysis methodologies for feedback generation; and (5) effective communication, interpersonal dynamics, empathy, and learning styles. The following keywords were searched individually without Boolean operators: *performance analysis, match analysis, feedback, communication, notational analysis, game analysis,* and *tactical analysis*.

Results

The literature identifies two complementary methodological approaches within match analysis: notational analysis, which objectively records technical and tactical events, and motion analysis, which quantifies players' physical performance through kinematic variables. Recent technological developments, including artificial intelligence and machine learning, have enabled multidimensional performance models capable of producing standardized and context-sensitive evaluations. However, evidence consistently indicates that objective data alone do not improve performance unless translated into structured feedback.

Feedback represents the educational core of match analysis by reducing the gap between current and desired performance. Objective feedback supported by video analysis and statistical reports improves motor learning, self-awareness, decision-making, and technical-tactical understanding more effectively than subjective observations alone. Its effectiveness depends on clarity, timeliness, contextualization, and adaptation to the athlete's characteristics. Conversely, excessive or poorly calibrated feedback may generate dependency and reduce autonomous learning.

The review also highlights the importance of distinguishing qualitative feedback, based on descriptive evaluation of performance, from quantitative feedback, based on measurable indicators. Both approaches should actively involve athletes in the process of error recognition and correction. Furthermore, communication quality strongly influences feedback effectiveness. Successful communication requires empathy, trust, active listening, and adaptation of both content and communication channels to individual learning needs. Modern pedagogical principles—including multimodal instruction, flexibility, and respect for individual learning pace—strengthen athletes' engagement and facilitate cognitive and emotional development.

Discussion

The findings indicate that contemporary match analysis has evolved from a purely descriptive approach into a multidimensional framework supporting both performance optimization and athlete education. The effectiveness of performance analysis does not depend solely on the availability of large datasets or advanced technologies but on the analyst's ability to transform objective information

into clear, contextualized, and actionable feedback. Consequently, match analysts require interdisciplinary expertise encompassing technical-tactical knowledge, data analysis, technology, communication, and pedagogy. Quantitative indicators should always be interpreted within the specific competitive context to avoid misleading conclusions. Beyond improving performance, match analysis promotes athletes' cognitive development by fostering tactical awareness, self-regulation, and informed decision-making. In this perspective, the analyst acts not only as a data specialist but also as a facilitator who translates complex information into understandable reports, visualizations, and video feedback that support coaches and athletes throughout the learning process. Furthermore, integrating match analysis with representative training tasks, such as Small-Sided Games, and wearable technologies enables coaches to optimize tactical learning, monitor training loads, and reduce injury risk through continuous performance assessment. However, the findings should be interpreted cautiously due to the narrative design of the review and the heterogeneity of the included studies.

Conclusions

Match analysis should not be regarded merely as a system for collecting and describing performance data but as an integrated educational process that combines observation, interpretation, feedback, communication, and athlete development. This review demonstrates that objective data become truly valuable only when delivered through timely, accurate, and context-specific feedback supported by effective communication and strong interpersonal relationships. Therefore, the educational impact of match analysis depends on the ability to transform quantitative and qualitative information into practical knowledge that enhances technical performance, tactical understanding, decision-making, and cognitive growth. Future match analysts should receive interdisciplinary training integrating technological, statistical, technical-tactical, and pedagogical-communication competencies to maximize the effectiveness of performance analysis within modern team sports.

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E-tutoring and Flipped Inclusion in university Virtual Learning Environments: a protocol for soft skills and socio-emotional inclusion

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The digital transformation of higher education has expanded opportunities for access, flexibility and personalisation of learning pathways, yet it has also made more visible a number of critical issues connected to the quality of educational relationships within Virtual Learning Environments (VLE). Physical distance can plausibly translate into a risk of isolation, reduced engagement, social disconnection and a weakening sense of belonging, with repercussions on the development of transversal competences such as collaboration, communication, active listening and conflict management (Moore, 1993; Garrison & Cleveland-Innes, 2005; Cinque, 2016). Within this context, the e-tutor takes on a function that goes beyond traditional technical-organisational support, establishing itself as an educational mediator and relational facilitator able to sustain participation, support processes of self-regulation and contribute to building an inclusive digital environment (Rotta & Ranieri, 2005; Biasin, 2018). This function is coherently mirrored in the Flipped Inclusion model, which conceives inclusion as a systemic and participatory process grounded in the integration of top-down design and bottom-up educational mediation (Corona & De Giuseppe, 2020).
Within this framework, the EIPS Protocol was developed, structured around four recursive phases: Explore, Ideate, Design and Experiment. In the first phase, the e-tutor identifies the student's needs, expectations, digital competences and possible barriers, in line with the principles of Universal Design for Learning. In the Ideate phase, peer exchange is fostered through forums, stimulus questions and problem-setting activities. In the Design phase, a learning contract based on measurable objectives is negotiated with the student, accessible resources are suggested, and self-regulated learning strategies are supported. In the Experiment phase, cooperative activities are developed in small heterogeneous groups, progressive forms of scaffolding are applied, and reflexivity is promoted through the writing of digital diaries (Wood, Bruner, & Ross, 1976; Mortari, 2019). Within this scenario, Artificial Intelligence is integrated as a co-agent supporting the e-tutor in personalisation, accessibility and study organisation, without diminishing the e-tutor's educational responsibility. AI thus provides useful support for the generation of adaptive materials, the development of diagnostic assessments and the production of preliminary feedback, while emotional, motivational and relational support remain distinctly human prerogatives (De Giuseppe & Tornusciolo, 2024).
The experimentation was conducted over three academic years, from 2022/2023 to 2024/2025, at the Giustino Fortunato University of Benevento, and involved 180 students enrolled in the L-19 and LM-51 degree courses, divided into an experimental group and a control group of 90 participants each. The pre-test showed that 47.8% of students identified the lack of personal interaction as the main critical issue of online learning, which guided the design of the intervention towards strengthening relational presence and collaborative dynamics. At the end of the protocol's implementation, the experimental group showed a significant increase in collaborative self-efficacy and in the main soft skills considered. The valuing of diversity rose from 35.2% to 91.4%, the assumption of roles and responsibilities from 38.0% to 91.4%, and the contribution to shared goals from 39.5% to 91.3%. Significant improvements also emerged in active listening (from 45.1% to 88.8%), prosocial behaviours (from 40.2% to 88.8%), acceptance of feedback (from 48.0% to 87.5%) and conflict management (from 30.1% to 77.5%). Qualitative evidence drawn from the reflective diaries further confirmed the e-tutor's

role as a relational facilitator and the perception of AI as a useful tool, though not a substitute for educational presence (De Giuseppe, Tornusciolo, Quiroz Reyes, & Petruccelli, 2025).
The results confirm that the effectiveness of VLEs does not depend solely on the use of technology, but on the ability to design relationships, interactions and authentic opportunities for participation (Richardson et al., 2015). The level of satisfaction with the personalisation of the intervention, which stood at 53.3%, nonetheless indicates room for improvement and the need for specialised training of e-tutors on neurodiversity and instructional adaptation. The non-probabilistic sampling further limits the generalisability of the results, which is why a multi-centre monitoring study is currently underway at other Italian online universities, aimed at verifying the replicability of the model across different organisational ecosystems. The EIPS Protocol therefore proposes a replicable operational model for integrating technological innovation and pedagogical mediation, aimed at valuing the centrality of the person. E-tutoring could thus become a structural component of online university systems, capable of sustaining socio-emotional inclusion, autonomy, prosociality and the development of transversal competences.

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Towards inclusive education mediated by social robotics: trainee educators' perceptions of robotic systems analysis

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Among the transformations shaping contemporary educational contexts, social robotics is emerging as an innovative technological field capable of introducing physical presence, communication dynamics and multimodal forms of interaction (Neumann, 2023).
Unlike other digital technologies, social robots not only perform functions related to instructional support, communication facilitation and adaptive learning (Woo et al., 2021; Youssef et al., 2023), but provided that the intended educational objectives are clearly defined they can also directly influence the emotional and relational dimensions of the educational experience (Martinez-Roig, 2024), affecting interaction patterns, student participation (Woo et al., 2021), motivation and support throughout learning activities (Youssef et al., 2023).
In this regard, the use of social robots in educational settings does not automatically lead to improved student learning outcomes. Rather, their effectiveness depends closely on the quality of the learning experience they help create, the role assigned to robotics within educational activities and the extent to which educators and teachers understand and interpret both the opportunities and limitations of social robotics (Mullick, 2025). Research on human-robot interaction is still in a stage of consolidation and continues to face significant methodological, technical and pedagogical challenges (Tekerek et al., 2026). This exploratory study adopts a mixed-methods research design (Creswell & Clark, 2011), involving approximately 380 pre-service educators, specifically 287 Italian university students enrolled in Educational Sciences programs at the University of Suor Orsola Benincasa in Naples and 94 Spanish university students enrolled in Educational Sciences programs at the University of Alicante.
The research was structured into four phases: (1) the administration of an initial anonymous structured questionnaire designed to collect participants' perceptions of the use of robotics in education before exposure to social robots; (2) a practical experience with the quadruped robot Go2 Unitree; (3) a practical experience with the humanoid robot Pepper; (4) a comparative analysis of the two robotic systems in terms of their physical design, functionalities, interaction modalities, level of trust elicited and their potential role in supporting teaching and learning processes. The data analysis revealed, first, that students generally displayed a neutral attitude toward social robotics, accompanied by moderate levels of interest and curiosity, but also by uncertainty and hesitation regarding its practical application in educational settings.
This pattern is consistent with the technology acceptance literature, which suggests that intention to use depends on variables such as trust, perceived usefulness and the clarity of implementation conditions (Beuscher et al., 2017; Burdett et al., 2022; Tutul et al., 2026). The findings also indicate that the morphological characteristics of robots represent a significant factor in shaping students' perceptions according to the educational objectives pursued (Woo et al., 2021). The comparison between the two social robots showed that Pepper was preferred in terms of suitability for the school context, trustworthiness and quality of interaction, whereas the Unitree robot was valued primarily for laboratory-based activities and STEM education.
In particular, participants perceived robots as playing a predominantly complementary role to that of the teacher, in line with a non-substitutive view of educational technology (Mullick, 2025). The

findings further suggest that social robots are interpreted primarily as supportive educational tools rather than replacements for teaching (Maijala & Mutta, 2024), with the teacher remaining the central and irreplaceable figure in the educational process. Within this perspective, the effectiveness of robotics in education depends significantly on the functions assigned to robots by teachers and on the conditions of interaction within the classroom environment (Ceha et al., 2022). Consequently, the successful integration of these technologies into educational settings requires adequate teacher preparation aimed at fostering specific professional competencies (Li et al., 2025; Carlomagno, Vadalà, & Ricciardi, 2026).

This study therefore highlights that future educators adopt a balanced perspective, characterized by openness to technological innovation while simultaneously emphasizing the centrality of the educational relationship and the professional responsibility of the teacher. Social robotics is thus interpreted as an important educational resource (Di Tore, Todino, & Sibilio, 2019) that teachers may employ without relinquishing their essential role as facilitators of teaching and learning processes.

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Topic 3

Generative AI and New Narratives of the Self

In the mirror: rewriting of the self. The interaction between autobiographical practice and generative artificial intelligence.

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The spread of generative artificial intelligence systems opens new questions also within the field of autobiographical practices. Writing about oneself, traditionally understood as a space for reflection, distancing, and attribution of meaning to lived experience, today encounters tools capable of intervening on the text, modifying its tone, amplifying some of its aspects and proposing different narrative perspectives. The possibility of receiving a reworked version of one's own account introduces a further element into the autobiographical process: the subject no longer confronts only what he or she has written, but also a variant of his or her own text that appears to him or her, at the same time, familiar and foreign.

The present contribution examines this space of tension. Attention is directed rather to the reactions that such rewriting may arouse, algorithmic rewriting therefore appears as a mediating device. The present work is based on the hypothesis that algorithmic rewriting may have a pedagogical value if understood as a mediating device that may activate new questions in subjects about their own account. The narrative identity of each person is not immutable, but is constructed through interpretation and autobiographical reflection (Ricoeur, 1988).

With the introduction of chatbots based on Large Language Models, technology produces linguistic responses becoming a "quasi-other" (Osler, 2026), an artificial interlocutor capable of generating real effects on conversation. Communication can therefore produce effects even in the absence of an intentionality assimilable to the human one (Rivoltella, 2024). The algorithmic rewriting of autobiographical texts has no value in itself, its value depends on the relationship that the subject establishes with the returned text.

This is the "hermeneutic paradox": ChatGPT's algorithmic rewriting can produce reflective effects even when the user knows that they do not derive from an authentic understanding of his or her experience, the chatbot's response can be useful not because it is true, but because it induces the person to look at his or her own history from another perspective and to formulate new questions (Kvietkute & Ness, 2026).

The risk is precisely that of delegating to the machine the authority to tell who we are (Osler, 2026). In the present work, AI is therefore considered as a symbolic device of mediation. The machine returns to the subject a text that is, at the same time, recognizable and altered and the underlying hypothesis is that such a gap may activate reflective effects.

The present study is qualitative and exploratory and has the objective of observing in a circumscribed way the reactions that emerge when a subject encounters an algorithmically reworked version of his or her own autobiographical text.

For each text, three variants were produced, corresponding to three prompting protocols: emotional intensification; narrative distancing; change of point of view. The corpus analyzed includes: 3 original autobiographical texts; 9 rewriting generated by the system; 3 qualitative questionnaires completed by the participants.

The feedback forms were analyzed through a qualitative content analysis with a deductive orientation (Hsieh and Shannon, 2005). In the construction of the feedback forms, four dimensions were chosen that oriented the participants' reflection: relationship between recognition and estrangement; explicitation of implicit meanings; effects of distancing and change of perspective; attribution of authenticity and interpretive authority to algorithmic rewriting.

The encounter with the algorithmic rewriting produces in the three cases a tension between familiarity and estrangement. The bodily reactions show that reading is not experienced as a simple exercise in

textual comparison, but gives rise to sensations of emotion and surprise. Algorithmic rewriting is perceived as a text that is one's own and not one's own, its reflective capacity resides precisely in this gap.
The participants report that the algorithmic rewriting broaden the perception of the lived experience, but do not transform autobiographical memory, nor add forgotten elements to the memory. In the responses of the first two participants, the rewriting in the third person is perceived as cold and incapable of returning the emotional density of the experience, while in those of the third participant the distancing allowed recognition, an effect of validation.
The attitude of the participants is devoid of "deference" toward the machine; on the contrary, they receive the rewriting critically, always comparing them with their own lived experience and keeping attention high on passages perceived as inaccurate, artificial, or excessively interpretive.
Although the study presents evident limitations linked to the small number of participants and to its exploratory function, it can be stated that, in the three case studies, algorithmic rewriting functioned as a reflective device. Its reflective value does not reside so much in the capacity to reformulate more or less authentic readings of autobiographical experience, as in the reaction produced in the subject. Algorithmic rewriting can be interpreted as a form of narrative mirror: it does not necessarily return a truth about the subject, but produces a textual configuration that the subject is called upon to recognize, contest, or reject. Precisely for this reason, the pedagogical value of AI should not be sought in the authority of the output, but in the possibility of activating critical work on the distance between the original account and its artificial reworking (Vallor, 2024; Fabry, 2025).
AI can be used as a tool of mediation, capable of producing narrative variants and generating questions, but it is the subject who must carry out the hermeneutic work on his or her own experience.

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Thinking of otherness in the era of ai.
For a pedagogy of emotional intelligence in formal contexts

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The education of emotional intelligence becomes central within formal contexts insofar as it concerns the formation of subjects capable of recognising themselves, others, and the relational fabric of human experience. Children and adolescents are growing up amid affective precariousness, the fragility of adult presence, and the increasing technological mediation of interpersonal exchanges. In this scenario, human agency risks being obscured by practices that transfer to intelligent machines functions of listening, guidance, and consolation. The shift from embodied relationship to artificial interaction represents a critical juncture in contemporary education. Although young people are aware that chatbots, voice assistants, and Emotion AI systems possess neither consciousness nor authentic emotional participation, they increasingly entrust such devices with their insecurities and their need for recognition. The machine appears available, patient, and non-judgemental; for this reason, it is perceived as an interlocutor when adult relationships capable of genuine listening are lacking. This phenomenon reveals a crisis of educational presence and a demand for dialogue. Hence the need for a critical pedagogy of emotional intelligence, able to avoid both fascination with artificial empathy and the abstract condemnation of technology. Educating emotions does not mean repressing impulses, but accompanying young people in recognising emotional life as a dimension of existence. The adult educator cannot delegate this task to the machine, since simulated empathy does not coincide with human encounter: it may produce a language of comfort, but it does not share vulnerability, does not inhabit the uncertainty of relationship, and does not answer ethically for itself before the other. The issue arises already in childhood, when play, learning, and socialisation are traversed by digital environments. Immersive experiences, online challenges, and mediated interactions may interfere with emotional development, fostering isolation, anxiety, or difficulty in distinguishing simulation from lived reality. At the same time, some applications of Affective Computing can support learning when placed within intentional educational frameworks: by detecting signs of frustration or boredom, they can adapt exercises, offer encouragement, or suggest pauses. With neurodivergent pupils, such tools may foster socio-emotional skills, provided they remain instruments rather than substitutes for the educational relationship. Narration assumes a decisive pedagogical function. Language, storytelling, and digital storytelling enable children to give symbolic form to emotions, identify with characters, understand the affective states of others, and develop empathy and self-regulation. Digital technologies can enrich this process only when accompanied by adults capable of deciphering meanings and safeguarding human interaction. In adolescence, the onlife condition makes online and offline experience increasingly difficult to separate, while algorithms intervene in identity formation, social affiliation, and self-representation. In a developmental phase marked by emotional reactivity and sensitivity to peer judgement, platforms amplify the need for approval through visibility metrics and continuous comparison. This gives rise to the paradox of adolescents who are hyperconnected yet lonely, exposed yet not genuinely heard. AI companions offer immediacy and absence of judgement, but they risk habituating young people to a form of relationship without conflict, waiting, or the resistance of otherness. Reflection on artificial intelligence requires an interrogation of the very idea of intelligence and of the human. The reference to the Mechanical Turk shows how, whenever a civilisation imagines a machine capable of thinking, it also projects onto that machine a question

about itself. Today, the human being is no longer hidden inside the device as a spectacular deception, but is inscribed within algorithms in the form of data, classifications, models, design choices, and economic interests. The algorithm educates even when it does not present itself as educational: it educates the gaze by arranging what becomes visible, desire by reinforcing preferences, time by habituating subjects to immediacy, and judgement by naturalising what has been ordered by a procedure. In school, such power becomes a resource only when brought back within the horizon of pedagogical intentionality. Education cannot compete with the machine on the terrain of speed or informational accumulation; its vocation concerns judgement, deliberation, moral imagination, and compassion. Within formal contexts, emotional intelligence and empathy emerge as structural competences of education. Emotions participate in the construction of meaning, memory, motivation, and the quality of learning. Empathy cannot be reduced to algorithmic calculation or signal recognition: it is a movement towards the other, an act of listening, interpretation, and shared construction of meaning. Technology can support inclusive and wellbeing-oriented environments, but it cannot replace the sensitivity of the educator. The ultimate aim is the design of an authentically human existence in the age of algorithmic reproducibility. To educate means to withdraw the subject from performative reduction, commercial profiling, and the quantification of personal value through likes and visibility indicators. It means restoring centrality to bodily presence, shared rituals, and the possibility of being recognised not as data, but as a singular biography. Intelligent machines may foster emotional awareness, inclusion, and the personalisation of learning, but only within a framework grounded in relationship, responsibility, and care. To educate in the Fourth Revolution means preventing human experience from being entirely translated into procedure or simulation.

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Evolutionary processes in corporate governance: pedagogical research perspectives.

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Corporate governance is one of the areas most affected by the economic, technological and social transformations that have taken place in recent years. The emergence of complex digital ecosystems, the automation of decision-making processes and the spread of artificial intelligence (AI) are redefining not only the way organisations operate (Abriani, 2020), but also the epistemological and value-based assumptions on which strategic decisions are founded.

Modern business is undergoing a profound transformation (Rossi, 2012). Corporate governance, traditionally understood as a set of rules, structures and mechanisms designed to ensure the control and management of the enterprise, now tends to take on a dynamic and relational form, in which human actors, technologies, information networks and socio-cultural contexts interact (Fenwick et al., 2018). At the same time, the issue of inclusion and organisational well-being has taken on increasing importance: organisations are increasingly called upon to respond not only to economic performance targets, but also to demands for equity, social sustainability and the valuing of differences (Schneider, 2022). Inclusion, in this sense, emerges as a strategic dimension of governance, capable of influencing the quality of decisions, innovation and organisational resilience.

In light of these changes, there is a need to consider the impact that digital technologies and, in particular the artificial intelligence, may have on corporate organisational structures and governance models. Technological innovation is no longer merely a tool for boosting production efficiency, but also constitutes a strategic resource in the processes of administration, control and corporate decision-making support. AI can, in fact, help to make the Board of Directors' decision-making processes faster, more accurate and more effective, facilitating the processing of large amounts of data and information (Hilb, 2020) and guiding choices towards the pursuit of strategic objectives and corporate social responsibility. From this perspective, it is reasonable to anticipate a growing integration of AI systems into activities supporting management bodies.

The introduction of AI into corporate governance systems creates new opportunities (Falce et al., 2018), but also raises significant ethical, organisational and social questions. On the one hand, AI offers advantages linked to processing capacity, error reduction and greater objectivity in assessments; on the other, it requires critical reflection on the responsibilities arising from its use (Teubner, 2019) and on the limits that must be set to ensure that technology remains at the service of people.

It is essential that the corporate governance of each company takes steps to influence its organisational culture (Buemi et al., 2015). The relationship between organisations and technologies cannot be interpreted in terms of mere instrumental adoption. Technologies, and in particular AI, contribute to transforming organisational practices, professional roles and corporate cultures, in a process of continuous co-evolution (Rivoltella, 2012). Organisations introducing AI systems are called upon to redefine skills, responsibilities and assessment criteria. This process requires significant investment in training and cultural development to prevent technologies from becoming factors of alienation or exclusion. In this context, corporate governance plays a strategic role in guiding the co-evolution between technologies and the organisation.

From this perspective, AI should not be seen as a substitute for human beings, but rather as a tool to support decision-making and oversight functions. The aim is to foster a productive collaboration between human expertise and computational capabilities, transforming the Board of Directors into a space for interaction between people and intelligent technologies, capable of combining organisational efficiency with social effectiveness.

Based on these considerations, a research project has been launched at the 'Giustino Fortunato' Telematic University in Benevento, as part of the research activities of the Permanent Observatory on Systemic Inclusivity, aimed at investigating the relationship between corporate governance, artificial intelligence, inclusion and organisational well-being. The study is designed as a pilot research project aimed at verifying whether, within the context of corporate governance, it is possible to promote organisational development pathways geared towards building an inclusive culture.
The research questions are as follows: 1) Is it possible to foster corporate governance to promote a participatory environment? 2) Is it possible to develop an organisational culture capable of creating inclusive corporate governance?
The research involved companies, schools and associations in the Campania region. More specifically, the project aims to test cooperative learning methodologies within corporate contexts, with the aim of increasing the level of inclusion among those working within the organisation. Among the strategies considered, the Flipped Inclusion model is of particular relevance. When applied to corporate governance, Flipped Inclusion enables decision-making processes to be reimagined in a participatory and inclusive manner. Boards and senior management can adopt practices such as active listening, widespread consultation and co-design, moving beyond rigidly hierarchical decision-making models.
Numerous practical examples demonstrate how Flipped Inclusion can contribute to improving organisational wellbeing. The active involvement of individuals strengthens a sense of belonging, increases motivation and fosters the development of soft skills (De Giuseppe, 2016b).
In conclusion, Flipped Inclusion emerges as a model particularly suited to addressing the challenges of corporate governance in the AI era, offering concrete tools to integrate inclusion, participation and well-being in a systemic manner (De Giuseppe, 2016b).

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Making Teachers' Professional Knowledge Observable

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Over recent decades, educational research has paid increasing attention to inclusion, teacher education, and, more recently, applications of artificial intelligence in education. Yet an epistemological question remains open: how can the professional knowledge that teachers build through everyday experience become observable? A substantial part of professional competence arises from the interaction of experience, reflection, embodiment, and educational relationships. It is situated, dynamic, and often tacit knowledge, which is difficult to access through traditional qualitative procedures.

The issue is particularly relevant for teachers with visible or invisible disabilities. While scholarship has extensively addressed organizational barriers, accessibility, and inclusive policies, the professional knowledge that can arise from vulnerability, adaptation, disclosure, and daily negotiation within educational settings has received less attention. These experiences may generate pedagogical, relational, and reflective competencies that rarely become shared resources of the professional community.

Narrative Inquiry has established the value of stories for understanding the construction of meaning and professional identity (Bruner, 1990; Ricoeur, 1992; Clandinin & Connelly, 2000). This paper does not propose a new paradigm of narrative research; it proposes a methodological extension, introducing a reflective device that supports the construction of data before scientific interpretation. Initial narration is essential, but it does not necessarily exhaust the knowledge held in experience.

From Story to the Reflective Construction of Knowledge

In our view, the limitation of contemporary narrative research does not lie in its ability to collect stories, but in the limited availability of methodological devices that support participants in the reflective construction of meaning. Professional knowledge remains embedded in practices, everyday decisions, and adaptive strategies developed over time; it does not emerge automatically from the account of experience.

We therefore propose viewing narrative research also as a methodologically designed space for reflexivity. Knowledge requires narration, critical rereading, recognition, and reworking. Qualitative data do not consist solely of the initial account, but also of the transformations of meaning that arise when participants return to their experience and interpret it through new connections.

This position is consistent with Schön's (1983) professional reflexivity, narrative constructions of identity, and Embodied Education (Gomez Paloma, 2014). Between narration and scientific interpretation, a dialogic space is introduced to make the construction of professional knowledge more explicit, without altering the epistemological foundations of narrative research.

The Narrative-Reflective Protocol and the N.A.R.R.A.T.E. Framework

The Narrative-Reflective Protocol takes shape within this perspective. It was developed as part of doctoral research focused on teachers with disabilities. It is not an alternative technique for qualitative analysis, but a methodological device that supports the transformation of lived experience into scientific data through a recursive sequence of narration, reflective feedback, and re-narration.

The interpretive model is the N.A.R.R.A.T.E. framework, articulated through Narrate, Analyze, Reflect, Reconstruct, Articulate, Transform, and Empower. Rather than defining a prescriptive succession of stages, it describes a dynamic and generative movement through which professional knowledge can progressively become observable, discussable, and shareable.

The framework's originality lies in bringing established perspectives into a single methodological architecture: Narrative Inquiry, professional reflexivity, embodied education, and Disability Studies.

This integration holds together narrative meaning-making, embodied professional knowledge, disclosure, reflexivity, and dialogic mediation.

The Second Narrative Reader: Dialogic Mediation

The proposal's most innovative element concerns the role assigned to generative artificial intelligence through the construct of the Second Narrative Reader. Unlike approaches that use AI to automate coding or data interpretation, AI here has an exclusively dialogic role: it offers participants a careful reorganization of their own narratives through questions, connections, and prompts anchored in the original text.

Qualitative data do not coincide with algorithmic output, but with the participant's response to the feedback received: confirmation, integration, revision, or rejection. Artificial intelligence does not interpret data, produce scientific evidence, or replace the researcher. It expands the space for reflexivity, while methodological, epistemological, and ethical responsibility remains entirely with the researcher.

The innovation therefore lies not in AI use per se, but in designing a function that preserves participants' interpretive agency. In a sensitive area such as the professional stories of teachers with disabilities, this distinction is crucial: technology may support the emergence of meanings, but it cannot appropriate experience or determine its scientific value.

Conclusions

This contribution maintains that much teachers' professional knowledge remains invisible not because content is absent, but because available devices are insufficient to support its reflective emergence. The Narrative-Reflective Protocol and N.A.R.R.A.T.E. are proposed as tools for accompanying the transformation of lived experience into professional knowledge that can be observed, discussed, and shared.

Empirical validation is the natural next step. It will be necessary to assess whether the protocol supports the emergence of tacit knowledge, whether the Second Narrative Reader broadens participants' reflexivity, and whether the model can be transferred to different educational contexts. If these hypotheses are confirmed, N.A.R.R.A.T.E. may provide narrative research with a methodological extension: not a replacement for human interpretation, but more rigorous conditions through which experience can be revisited, deepened, and transformed into shared professional knowledge.

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Generative ai in the construction of teacher professional identity: a scoping review

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The emergence of Generative Artificial Intelligence (GenAI) is profoundly transforming contemporary educational systems that affect not only teaching and learning processes but also teachers' professional identities (Zhou, 2025). The integration of GenAI cannot be considered simply as a technological innovation; rather, it should be understood as a social phenomenon (Storey et al., 2025). Teacher preparation has become a critical factor for the meaningful adoption of GenAI. Indeed, teachers need to acquire the necessary competencies to effectively use the technology. Given the limited number of publications identified in this area, for this review, the research question was: How does the use of GenAI affect the development of teachers' professional identities? Does it primarily support existing identity processes, or does it also help to reshape the dimensions of teachers' professional identities? If so, through what mechanisms and to what extent?
Artificial intelligence (AI) is "the capacity of computers or other machines to exhibit or simulate intelligent behavior; a related field of study" (OED, 2023). Recently, the concept of TPI has gained particular importance; it is generally understood as a dynamic, social, and context-dependent process through which teachers construct meanings about themselves and their profession (Li et al., 2022). Given that GenAI is changing teachers' identities and influencing the way they perceive their roles in educational settings (Zhai, 2025) and transforming their beliefs and practices (Lan, 2024) , strengthening their AI-related competencies is of strategic importance (Cukurova, 2025). However, teacher education programs do not seem to pay enough attention to areas that emphasize teacher identity development (Ollington, 2025).
This Scoping Review (Tricco et al., 2018; Ghirotto, 2020) aimed at systematically mapping the knowledge available through the identification, analysis, and classification of existing scientific evidence. The search was conducted in Scopus and Web of Science and the search included the combination of: ("teacher professional identity" or "teacher professional identity development" or "teacher identity") and ("artificial intelligence" or "GenAI" or "generative artificial intelligence"). The search led to 324 articles. After the title screening stage, 13 articles were retained from Web of Science and 19 articles from Scopus. Subsequently, the abstracts of the selected articles were reviewed by all three researchers. Through this process, 19 articles were identified. Then, the data extraction phase for the included studies began. To this end, the researchers reviewed and analysed the data collected. This method allowed for the cataloguing and organization of information in a structured manner, facilitating the synthesis and interpretation of the data.
The analysis shows that the integration of GenAI acts not only as a technical innovation but also as a powerful catalyst for the reconfiguration of teachers' professional identities. AI technologies are not merely tools but active agents that shape teachers' teaching practices, pedagogical methods, and perceived identities in the classroom (Ghiasvand & Seyri, 2025). The findings indicate a shift from traditional roles towards hybrid and dynamic configurations, as sustained engagement with GenAI is believed to reconfigure teachers' identities in much deeper ways than simply adopting a tool (Fathi, 2026). Studies emphasize that readiness to use AI cannot be limited to the development of technical skills. It is also necessary to promote reflective, critical, and ethical skills (Yu and Smith-Mutegi, 2026; Guan et al., 2025; Haqi et al., 2026; Lan, 2024). AI-mediated education has encouraged self-reflection among teachers and improved learning environments for continuous professional growth (Haqi et al., 2026). At the same time, teachers face ideological tensions and must adapt to new tools and methods (Lan, 2024); they experience identity tensions and conflicts related to the balance

between the human and technological aspects of teaching, continuity and innovation, professional

autonomy and collaboration with algorithmic systems (Beijaard et al., 2024; Haqi et al., 2026; Lan, 2024). In general, teacher identity is no longer considered solely as an individual characteristic, but rather the result of dynamic interactions with individuals, technologies, teaching practices, and institutional contexts (Yu & Smith-Mutegi, 2026; Haqi et al., 2026). Findings show that most studies published in the past two years have focused mainly on foreign language teachers, especially in China and Iran, with limited attention to inclusive education.

In conclusion, the literature review shows that GenAI does not simply modify teaching practices but participates in the processes through which teachers' professional identities are constructed and influences the representations that teachers create of their professional roles, competencies, and responsibilities. However, the evidence remains fragmented, and there is still no consensus on the extent to which GenAI is understood as a supportive tool or as a transformative agent in teacher identity development. Across the studies analyzed, teachers' professional identities emerge as a dynamic and context-dependent construct shaped by the interaction between personal beliefs, professional practices, institutional contexts, and digital technologies. GenAI creates both new opportunities and tensions regarding professional autonomy, ethical judgment, and the human dimensions of teaching, reinforcing the need for teacher education programs that foster critical, reflective, and ethical engagement with AI.

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From reflective journal to ai-mediated digital storytelling: fostering professional reflection in special education teacher training

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In increasingly complex and technology-rich educational environments, teachers are expected not only to master instructional strategies but also to critically interpret educational situations and make pedagogically informed decisions. Professional reflection has therefore become a fundamental component of teacher education, enabling educators to connect experience with pedagogical action (Dewey, 1933; Schön, 1983; Mortari, 2003). Within this perspective, the reflective journal functions as a self-narrative pedagogical device through which teachers reinterpret classroom situations, strengthening professional judgement and inclusive educational decision-making. From a narrative perspective, reflection transforms experience into meaning (Bruner, 1992).

Digital storytelling has also been recognised as an effective strategy for fostering reflection and professional learning (Robin, 2008; Banzato, 2014; De Marco & Colazzo, 2021; Mazzini et al., 2025). At the same time, recent research has highlighted both the educational potential of generative AI and the need for its pedagogically grounded integration into teacher education (Holmes et al., 2019; Tan et al., 2025). However, limited attention has been devoted to the intentional integration of reflective writing, digital storytelling, and generative AI within a coherent reflective learning pathway.

Against this background, the present study addresses the following research question: How does a training programme integrating the reflective journal, digital storytelling, and generative AI support the development of professional reflection among special education teachers? To address this question, a scaffolded training programme guided participants from reflective writing to AI-mediated digital storytelling. The study contributes to research on reflective teacher education while advancing current debates on the pedagogically meaningful integration of generative AI in teacher professional learning.

The Training Programme and Methodological Design

The research was conducted within the Special Education Teacher Training Programme at Pegaso Online University and involved 130 teachers enrolled in the primary school specialisation track. A training programme entitled *From the Reflective Journal to Stories in the Classroom* integrated reflective writing, digital storytelling, and Gemini Storybook through a scaffolded learning pathway designed to preserve teachers' interpretative agency and educational decision-making.

Participants analysed five critical episodes, completed a reflective journal, created AI-mediated storyboards, and produced digital stories using Canva. The reflective journal therefore functioned as the pedagogical core of the training programme, providing the foundation upon which all subsequent narrative and multimodal activities were developed. The scenarios were designed by iteratively prompting ChatGPT to generate realistic classroom situations. ChatGPT was employed exclusively to support content generation during the design phase, whereas pedagogical validation, revision, and final approval were undertaken by the research team.

An exploratory mixed-method design with a qualitative emphasis investigated how integrating the reflective journal, digital storytelling, and generative AI supported professional reflection. Reflective journals, AI-mediated storyboards, digital stories, and open-ended questionnaire responses were analysed through Reflexive Thematic Analysis (Braun & Clarke, 2006, 2021), whereas questionnaire data were analysed descriptively.

Findings and Conclusions

The analysis identified four dimensions of professional reflection: looking beyond behaviour, recognising emotions, designing inclusive responses, and rethinking the professional role. Evidence of this progression emerged in the reflective journals. One participant wrote, “I would interpret the child's behaviour as an expression of anxiety rather than a lack of ability” (RJ-12). Another observed, “It is not enough to reassure the child; it is necessary to create a sense of security” (RJ-18). These excerpts illustrate the shift from describing observable behaviours to developing pedagogical interpretations that informed more inclusive educational action.

Comparison of AI-mediated storyboards generated from the same critical episode revealed diverse pedagogical interpretations despite a shared educational scenario. Digital stories produced in Canva further consolidated these reflections through multimodal narration. Rather than replacing reflective judgement, generative AI expanded opportunities to reinterpret educational experience while preserving participants' interpretative agency. Questionnaire findings reinforced evidence from the reflective journals, AI-mediated storyboards, and digital stories. Participants identified the reflective journal as the pedagogical core of the learning pathway and digital storytelling as a bridge between reflection and educational design. Generative AI was perceived as supporting narrative elaboration and creative thinking without replacing teachers' professional responsibility. These findings suggest that the educational value of AI depends less on technological sophistication than on its pedagogically grounded integration within structured reflective learning environments.

The study proposes an instructional model integrating reflective writing, multimodal storytelling, and generative AI into a single reflective process. It contributes to current debates on AI in teacher education by showing that technological innovation should remain grounded in pedagogical intentionality and reflective practice. Ultimately, the future of AI in teacher education should not be framed as a technological challenge but as a pedagogical opportunity to redesign reflective learning in ways that strengthen, rather than diminish, teachers' professional judgement.

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Arts, Generative Technologies, and Appreciative Inquiry for inclusive teacher education: an exploratory study on the transformation of disability representations

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The transformation of disability paradigms has rendered interpretations based solely on diagnosis inadequate, directing educational thought towards a perspective that brings together functioning, contextual conditions, individual aspirations, and possibilities for development. Disability thus emerges from the interaction between personal and environmental conditions and cannot be reduced to a purely clinical construct (Oliver, 1990). Within this framework, the Life Project becomes a pedagogical instrument oriented towards quality of life, self-determination, meaningful relationships, and inclusion (Schalock & Verdugo Alonso, 2002), recognising individuals through their aspirations, relational networks, and connections with their communities (Lascioli & Pasqualotto, 2021; Wehmeyer, 2020).

This perspective directly challenges the education of special education teachers, who are required to interpret complexity through recursive processes of observation, reflection, and pedagogical adjustment (Sibilio, 2015; Aiello, 2024). Appreciative Inquiry builds upon existing resources, strengths, and experiences, transforming interpretative frameworks without overlooking conditions of vulnerability and inequality (Cooperrider & Srivastva, 1987).

Arts-based practices provide access to dimensions of experience that technical language may constrain, enabling music, theatre, dance, and visual expression to function as mediators of identity, agency, and full participation (Barone & Eisner, 2012; Symeonidou, 2022). Digital, assistive, and generative technologies may further expand this space when embedded within a clear ethical and pedagogical intentionality, supporting autonomy, accessibility, and agency without replacing individual subjectivity or delegating educational decision-making to algorithmic systems (Loveless, 2011).

Exploratory plant and main evidence

The research-based training programme involved sixty-six participants engaged in developing Life Projects grounded in the domains of Quality of Life and integrating arts-based practices, technologies, and an appreciative approach. The materials produced, comprising project documents, reflective narratives, and questionnaires, were analysed through a mixed-methods and transformative framework in which quantitative, qualitative, and documentary dimensions were treated as interdependent levels of inquiry.

The findings reveal a shift from a language of deficiency to one of possibility. References to impairment, dependence, and need do not disappear from the projects but are repositioned within a broader framework in which desires, preferences, attainable forms of autonomy, meaningful relationships, and future trajectories come to the fore. This transition reflects a process of narrative de-medicalisation, whereby clinical information retains its relevance without becoming the sole criterion for interpretation. Planning is consequently directed towards the conditions that enable individuals to make choices, participate, learn, work, pursue their interests, and recognise themselves within non-segregating environments.

The arts proved effective in bringing to light goals that could not easily be verbalised and in supporting motivation, self-awareness, and a sense of belonging. Music assumed an identity-forming

and relational function, while technologies were represented as facilitators of communication, mobility, everyday organisation, and emotional well-being. The teacher's role was likewise redefined. Rather than appearing as a specialist primarily concerned with compensation, the teacher emerged as an ecosystemic facilitator capable of connecting schools, families, services, local communities, and wider support networks. Viewed *sub specie educationis*, inclusion was therefore understood not merely as physical presence within particular settings, but as the affective, relational, and developmental sustainability of participation.

Education and research perspectives

The emerging framework, conceptualised as the *Appreciative Artistic Life Design Model*, interprets the Life Project as an interconnected configuration of narrative agency, artistic mediation, technological facilitation, affective ecology, and an orientation towards quality of life. It provides teacher education with a heuristic structure through which to promote forms of planning that remain open, participatory, and amenable to ongoing monitoring.

The exploratory nature of the study does not diminish the significance of the findings but rather defines their preliminary status. Future developments may involve larger samples, multicentre comparisons, longitudinal analyses, independent double coding, and the direct participation of persons with disabilities, families, and support services. Further investigation will also be required into the use of generative technologies, particularly to determine the extent to which they expand projective imagination or, conversely, reproduce stereotypes and existing asymmetries. The task of educational research is therefore to safeguard the centrality of the person and, *simul*, to prepare teachers capable of transforming tools, languages, and data into enabling conditions for self-determination, participation, and a flourishing life.

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Algorithmic narratives and affective expression: a study on the impact of generative artificial intelligence on the emotional writing of students and future teachers

Filippone Alfonso
De Carlo Maria Ermelinda

This contribution presents a mixed-methods study on the impact of generative artificial intelligence on emotional writing and the narrative construction of the self. The study moves from the assumption that generative AI does not merely support writing at a technical level, but may act as a symbolic mediator that intervenes in the way subjects organize emotions, relationships and personal experience into narrative form. The theoretical framework is grounded in the perspective of Digital Affective Literacy, understood as the ability to use AI systems critically in order to express, interpret and re-elaborate emotional and relational meanings without delegating authorship or agency to the algorithm.
The research adopted a quasi-experimental within-subject design. The sample included 148 participants: 50 lower secondary school students and 98 pre-service special education teachers. Each participant produced two narratives on the same relational theme: a baseline text written without AI support and a second narrative generated with the support of ChatGPT through prompts created by the participant. The writing tasks focused on personal relationships, including peers, family, friendship, affective relationships, the body, the self, social contexts, work and educational roles. Data collection integrated three self-report instruments: the Tromsø Social Intelligence Scale, the Emotional Expressivity Scale and the Berkeley Expressivity Questionnaire. The analyses considered textual length, emotional markers, emotional density, narrative depth, reflexivity, agency and relational complexity. A reflexive thematic analysis was also conducted to explore the qualitative transformations between baseline and AI-assisted narratives (Figure 1).

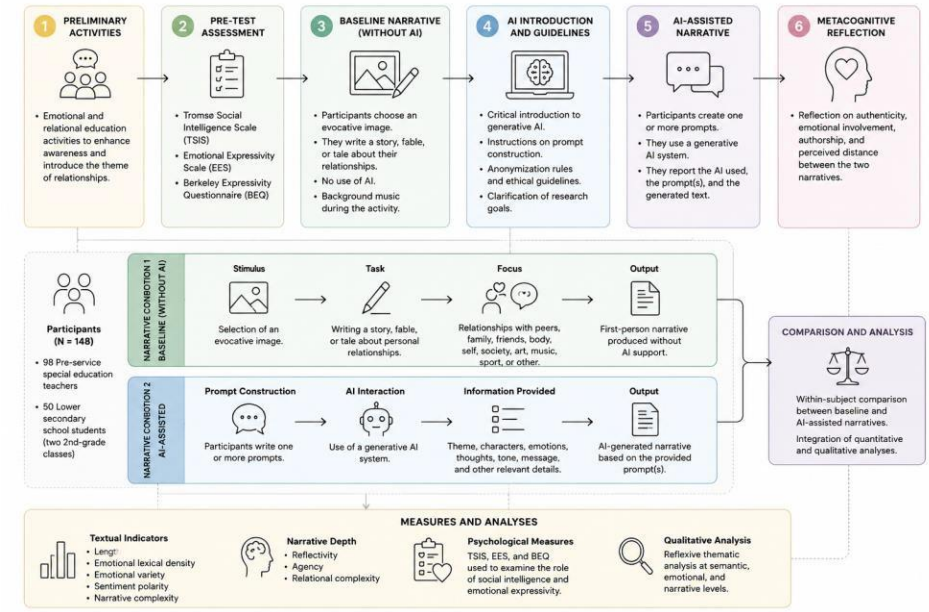


Figure 1. *Methodological design of the study*.

The results showed a significant increase in the length of AI-assisted narratives. In the overall sample, baseline narratives had a mean length of 70.32 words, while AI-assisted narratives reached a mean of 125.09 words. Emotional markers also increased from 0.59 to 1.66, and emotional density increased from 0.88 to 1.32 markers per 100 words. All differences were statistically significant. AI-assisted narratives also showed higher levels of reflexivity, agency and relational

markers. These findings suggest that generative AI supported the verbalization of emotional experience, helping participants to make feelings, thoughts and interpersonal dynamics more explicit.

The thematic analysis confirmed that AI did not simply expand the texts quantitatively, but transformed their narrative form. Baseline narratives were generally more implicit, concrete, situated and sometimes fragmented. Emotions often emerged through images, symbolic situations or actions rather than direct verbalization. AI-assisted narratives, by contrast, were more explicit, organized and oriented toward reflective closure (Figure 2).

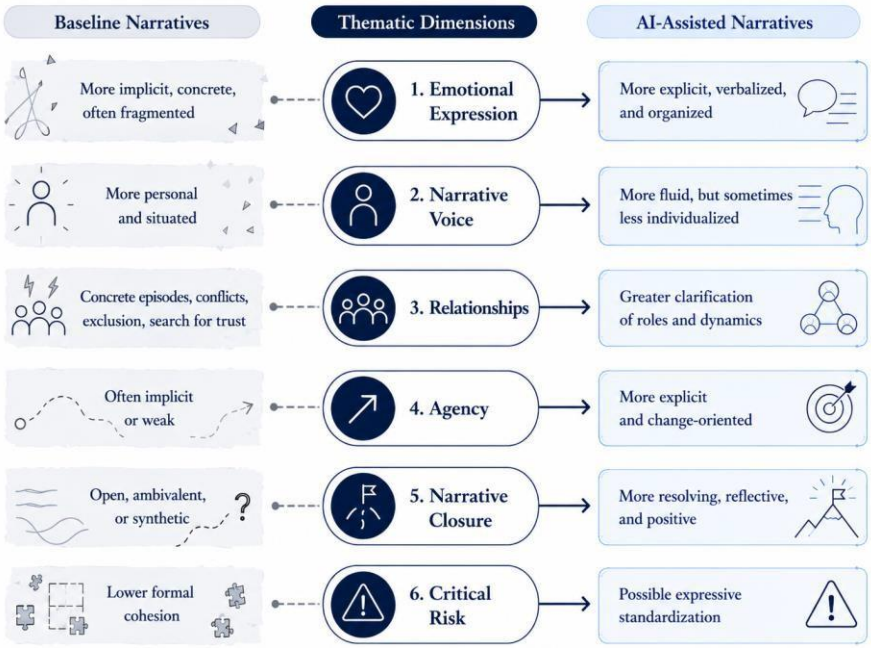


Figure 2. *Main thematic changes between baseline and AI-assisted narratives.*

In the student group, themes such as friendship, exclusion, shame and the desire for acceptance were often reorganized by AI into narratives of recognition, dialogue and personal growth. In the group of pre-service special education teachers, themes of care, inclusion, responsibility and educational relationships became more structured and pedagogically explicit.

However, this increased organization also raised a critical issue. Many AI-assisted narratives presented similar interpretative closures, oriented toward personal growth, understanding others, reconciliation or the positive transformation of conflict. This suggests a possible standardization effect: AI tends to make texts more fluid and coherent, but can also reduce complex experiences to more predictable narrative forms. Therefore, formal narrative improvement does not necessarily correspond to deeper or more authentic elaboration of lived experience.

The study highlights a pedagogical tension between expressive amplification and narrative authenticity. Generative AI can help learners name emotions, organize experiences and clarify relational meanings, but it may also weaken the singularity and ambivalence of personal voice. For this reason, the educational value of AI should not be identified with the production of longer or formally better texts. Rather, it lies in the possibility of using the comparison between the autonomous text, the prompt and the AI-generated text as a reflective space. In this space, learners can recognize what AI clarifies, what it adds, what it simplifies and what it risks replacing.

The main implication concerns the need to develop Digital Affective Literacy in schools and teacher education. Students and future teachers should be supported in using generative AI not as a substitute for personal expression, but as an object of critical interrogation. In particular, for pre-service special education teachers, this competence may become relevant for designing inclusive educational practices in which AI supports expression, reflection and participation without reducing the complexity of subjective experience. The study therefore suggests that generative AI can

become a meaningful resource for emotional and narrative writing only when it is embedded in a conscious pedagogical design that preserves authorship, agency and the relational depth of the self.

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AI-Mediated Listening and the Pedagogical Reconfiguration of Dialogue

Fornasari Alberto

The growing use of conversational artificial intelligence by adolescents cannot be read merely as a technological trend. It reveals a deeper transformation in the ways young people seek listening, recognition, and support within relational contexts that often seem unable to receive their words without judgment, haste, or misunderstanding. In this sense, chatbots are emerging as threshold spaces of interlocution: not substitutes for educational or therapeutic relationships, but preliminary environments in which speech can emerge, be tested, organized, and made narratable.

Recent research shows that young people approach AI systems because they are continuously available, readily accessible, controllable, and perceived as non-judgmental. These conditions lower the threshold of self-disclosure and make it possible to express doubts, loneliness, anxiety, or personal concerns that may remain unspoken in family, peer, or school relationships. This phenomenon may be interpreted through Media Naturalness Theory, which reminds us that face-to-face communication remains the richest form of interaction, while mediated communication lacks the density of embodied presence (Kock, 2005). At the same time, the Computers Are Social Actors paradigm explains why users attribute social qualities to technological systems and engage with them through relational scripts usually reserved for human interlocutors (Nass & Moon, 2000).

Within adolescent relational ecologies, AI assumes an ambivalent position. On the one hand, it may support processes of self-expression, cognitive clarification, and emotional regulation. Studies on young people's interactions with generative AI show that chatbots are frequently used to formulate confused thoughts, prepare difficult conversations, seek advice, and explore personal distress (Jung *et al*., 2025; Luo *et al*., 2025; McBain *et al*., 2025). The paradox is that one of AI's structural limits—its lack of intentionality, autonomous agency, and authentic emotional participation—may become, at the experiential level, a condition that facilitates openness. Precisely because the chatbot does not judge, react emotionally, or impose relational consequences, it may be perceived as a safer first space in which to speak (Dai *et al*., 2026).

On the other hand, accessibility must not be confused with genuine listening. AI can simulate empathy, produce coherent responses, and offer linguistic validation, yet it cannot embody the vulnerability, responsibility, and interpretative depth that define a truly educational encounter. Listening, in a pedagogical sense, is not simply the reception of words; it is an intentional and situated act through which the other's experience is welcomed, interpreted, and accompanied within a relationship capable of reciprocity and transformation. When distress becomes severe or when the request requires care, risk management, or ethical responsibility, artificial mediation reveals its limits. Research on AI-based mental health support for youth highlights weaknesses in therapeutic depth, transparency, and safety monitoring (Sobowale *et al*., 2025), while other studies warn that prolonged reliance on chatbots may foster isolation, dependency, and reduced recourse to human support (Wu *et* al., 2026; Ueda, 2025).

The pedagogical issue, therefore, is not whether AI should be accepted or rejected, but how its presence redefines the conditions of dialogue. Recourse to chatbots should be interpreted as a symptom of an unmet need for listening. Young people do not turn to artificial interlocutors simply because they are fascinated by technology; they do so because these devices make available a low-risk communicative threshold that many educational contexts struggle to guarantee. This challenges schools, families, and educators to recover listening as a deliberate practice, grounded in time, presence, recognition, and the capacity to sustain ambiguity.

For this reason, AI should be placed within educational ecologies as a threshold-device: a possible first passage toward expression, never the final destination of care. Pedagogy is called to guide young people from mediated self-disclosure toward embodied dialogue, helping them develop the

competencies required for reciprocity, disagreement, negotiation of meanings, and responsible help-seeking. The task is to ensure that what begins in artificial mediation can return to human relationships, where words are not merely produced and validated, but also recognised, questioned, and transformed.

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From Creative Tool to Cognitive Prosthesis: Generative AI, Digital Storytelling, and Adolescent Development

Marzullo Rossella
Milasi Davide

The integration of generative artificial intelligence into digital storytelling opens new possibilities for exploring adolescent identity, yet it entails significant pedagogical risks when used uncritically. This paper examines the distinction between AI as a tool and AI as a "cognitive prosthesis," arguing that the formative value of the technology depends on the cognitive and intentional conditions under which it is employed, rather than on the technology itself.

Autobiographical narration, following the tradition from Ricoeur (1990) to Bruner (1990), constitutes a fundamental practice of Self - construction, particularly relevant in adolescence, a phase engaged in the developmental task of identity (Erikson, 1968). Narrative difficulty - finding the right words for an emotion - is not an obstacle to be removed but an essential formative element, supported by neuroscientific evidence on the integration of prefrontal and limbic structures (Siegel, 2012).

The concept of cognitive prosthesis, derived from Clark and Chalmers' (1998) theory of the extended mind, describes artefacts that do not merely assist thought but replace it. Unlike tools such as the calculator, generative AI produces complete solutions from minimal input, drastically lowering the cognitive threshold required. Gerlich (2025) documented a negative correlation between frequent AI use and critical thinking, particularly pronounced among younger users. The relevant distinction is between AI as tool, when the subject already possesses competence to critically evaluate the output, and AI as prosthesis, when the objective remains undefined a condition in which cognitive responsibility is delegated to the system, producing a text formally coherent but devoid of authentic subjective elaboration. Regarding affective education, generative AI can produce convincing emotional descriptions, but these are simulations, not genuinely elaborated emotions - an apparent literacy that risks failing to develop real access to one's affective experience. Since empathy is grounded in self - recognition, a deficit here may translate, cumulatively, into an impoverishment of the relational fabric (Floridi et al., 2018) and greater vulnerability to psychosocial distress, as documented by the literature linking narrative identity and psychosocial health (McAdams, 1993).

The paper proposes a pedagogical model grounded in the principle of the "known expected output": AI use is legitimate when the user already possesses domain competence, precision of intention, capacity for critical evaluation, and willingness to assume intellectual responsibility for the final product. Drawing on Panciroli and Rivoltella's (2023) notion of "algorithmic pedagogy" and Ranieri's (2022) distinction between functional and critical digital competence, the paper outlines an educational framework built on five interconnected dimensions: cognitive, metacognitive, affective, technical and ethical. The educator's role is not to prohibit AI use but to design tasks that render the process visible alongside the product, and to ensure that students have developed prerequisite competences before AI is introduced as an advanced form of support.

A final section addresses emerging risks for minors within the AI ecosystem inappropriate content, emotional dependency on conversational chatbots, deepfakes, and predictive policing practices reviewing principles of ethical governance consistent with the best - interests of the child principle established by the UN Committee on the Rights of the Child (2021) and with Italian legislation (Legge n. 132/2025). Generative AI represents a tool of considerable expressive and cognitive power, yet this very efficacy constitutes its principal pedagogical risk: a system capable of credible simulation can replace the cognitive and affective effort underlying development. The guiding principle proposed is "competence before AI": before using AI to write, narrate, or express emotions, one must first have learned to do so autonomously. AI should be placed neither at the margins of education nor

at its centre, but in its proper position: an advanced tool at the service of already acquired competences, capable of expanding expressive capacities without replacing the irreplaceable work of authentically constructing the Self.

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From experience to narrative: artificial intelligence and digital storytelling in the processes of awareness within education

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This paper offers a reflection centred on the synergy between *Mindfulness-based* Self-Awareness Workshops, *Digital Storytelling* and Generative Artificial Intelligence in contemporary educational contexts. The aim is to investigate the implications for students' individual and collective identity exploration processes and for the development of critical, reflective and emotionally oriented digital literacy. In this context, digital media and AI are not regarded as mere technical tools, nor as a shortcut to delegating thought to machines, but as a symbolic extension of the mind and body (Di Domenico et al., 2025), serving to enhance self-awareness and relational responsibility. The training programme is structured according to the perspective of Embodied Cognitive Science (ECS), recognising that cognition is deeply rooted in the body and influenced by emotional experience. (Gomez Paloma & Damiani, 2021; Varela et al., 1991). Within the Self-Awareness Workshops, students practise intentional, non-judgemental attention to the present moment (Kabat-Zinn, 2015), which enables them to listen to themselves and observe the flow of sensations, thoughts and emotions without being at their mercy. This approach is fostered through structured physical and *mindfulness* practices, complemented by playful and creative group activities designed to promote inclusion and positive peer-to-peer communication (Gentilozzi et al., 2024). The skills acquired during the programme foster a new self-narrative, giving rise to a transformative autobiography. Within this narrative space, the act of telling one's story becomes the means of giving value to one's own experiences, gaining awareness of the transition from initial phases of anxiety and vulnerability to an experience of calm and integration. The subject of the narrative is the very identity that has developed within the workshops, which is lifted out of the fragmentary nature of episodic experience to be reorganised into a structure imbued with meaning, coherence and intentionality (Bruner, 1986). By respecting the collective dimension of the experience, Digital Storytelling can support the narrative through the creation of a multimedia artefact that encapsulates the experiences of all students, giving a voice to each person's story. This phase opens up a multitude of possibilities, including the integration of generative AI into the creation of the final product. The independent design and creation of a multimedia artefact require the use of audio and video editing platforms, thereby promoting participation in a situated learning experience capable of developing multiple forms of literacy and skills (Robin, 2008). The entire production process calls for constant practice in operational and cooperative *problem-solving*, whilst the need to negotiate stylistic and expressive choices within the group stimulates the ability to accept feedback and enhances processes of self-assessment and metacognitive reflection on one's own work. The idea of using generative Artificial Intelligence as an alternative during this multimedia rewriting phase raises concerns about the potential risk of delegation, which could stifle students' creativity and originality. However, when guided by a critical and informed approach, the integration of AI does not mean relinquishing the student's active role. The creation process, in fact, shifts towards a design phase characterised by the formulation of instructions (*prompts*), critical evaluation and revision of the output. The students' emotional experiences, autobiographical stories and selected materials are transformed into *prompts* to instruct the system through precise and agreed-upon guidelines, leading to a digital product that must reflect the initial intentions and be verified before receiving final approval from all parties. This approach requires a deliberate and conscious methodology, in which the cycle of *prompting*, evaluation and revision of the output serves to foster *agency, problem-solving* and metacognitive skills (Holmes et al., 2025). Consequently, the student does not passively delegate the task, but exercises authorial

supervision that links the bodily experience to its symbolic representation and promotes a mindful use of AI. In conclusion, against a socio-cultural backdrop that demands the convergence of , digital skills and socio-emotional wellbeing, the integration of Digital Storytelling and Generative AI into Self-Awareness Workshops appears to be a promising approach, consistent with European guidelines (UN General Assembly, 2017; Vuorikari et al., 2022). Through this synergy, technology ceases to be used merely as a technical tool – in a haphazard or passive manner – and instead becomes an extension of creativity and a vehicle for an emotionally conscious autobiography. As this is not an empirical study but a theoretical and design-oriented reflection, it is hoped that this contribution will offer useful insights for teaching practice and, at the same time, stimulate in the reader cross-cutting perspectives and understandings capable of rethinking well-being and digital citizenship in contemporary educational contexts.

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A.N.I.M.A.: An Experimental Pedagogical Model for Conscious Self-Narration in First-Cycle School

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Ranieri Giulia

Learning to narrate oneself is a decisive competence in primary and lower-secondary school. Recounting a personal episode requires selecting events, ordering them, assigning them meaning and translating them into words: a formative practice that gives shape to experience, names emotions and builds awareness of the self (Bruner, 1991; Demetrio, 1996). Psychology has shown how identity itself takes the form of an internalised and evolving life story. Generative artificial intelligence, now within reach even of young students, is however most often encountered in a substitutive mode, with the machine being asked to write in the student's place. Applied to autobiography, this mode delegates the very act that constitutes its core: a self-narrative generated by AI is, strictly speaking, no one's narrative.

A.N.I.M.A. proposes a reversal: AI does not write the self, but reads it. It works as an interpretive lens that makes recurrences, emotions and structures visible in texts students have already produced, returning a representation on which to reflect. The risk to be averted is cognitive offloading, which weakens the monitoring of one's own learning (Fan et al., 2025).

The model, evidence-informed in design, is consistent with the 2025 National Guidelines (D.M. 221/2025), which gradually replace those of 2012 by placing the person, identity and linguistic and reflective competences at the centre, and with the ministerial Guidelines on AI (D.M. 166/2025), which prescribe human responsibility, teacher supervision, protection of minors' data and the critical use of these systems. Four principles underpin its design: the student's authorial centrality, teacher mediation, AI as an object of inquiry rather than an anthropomorphised interlocutor, and metacognitive reflection (Flavell, 1979; Long & Magerko, 2020).

The pathway unfolds in four phases whose Italian names form the acronym A.N.I.M.A. (meaning "soul" in Italian) which is retained unchanged in English: Autobiografia Narrativa (Narrative Autobiography), Indagine (Inquiry), Mediazione algoritmica (Algorithmic Mediation) e Autoconsapevolezza (Self-awareness). The following description uses the English translations of each phase name.

In Narrative Autobiography, a human-only phase, students write a text about a significant experience within a protected space and without any judgement on form, with prompts differentiated between primary and lower-secondary levels. In Inquiry, students question the AI with analytical prompts to observe how the machine reads the text, prevailing emotions, recurring words and narrative structure, after the anonymisation of sensitive data. Algorithmic Mediation is the model's centre of gravity: the student compares what they meant to say with what the AI returned, and the machine's error becomes the occasion to reaffirm their own communicative intention and to understand that the system processes language probabilistically. In Self-awareness, finally, the text is reworked into an artefact (a revised version, a reflective journal, an emotion map, a comparison sheet), with the option to reject the AI's interpretations with explicit justification.

The expected advantages concern the safeguarding of authenticity, the development of metacognition, algorithmic literacy, metalinguistic reflection and personalisation. Critical issues remain to be managed: the privacy of the texts, the anthropomorphisation of the machine, the risk of dependence, algorithmic bias (Baker & Hawn, 2022) and the need for adequate teacher training. Assessment is formative and rests on a portfolio, a learning log and a four-dimension rubric: autobiographical awareness, metalinguistic reflection, critical capacity towards the output, and digital responsibility. This rubric aims to assess the process rather than the product.

The contribution is theoretical and design-oriented and awaits empirical validation, ideally through a comparative design contrasting classes that practise traditional autobiographical narrative with classes that adopt the model. Its value lies not in producing more correct texts, but in forming students capable of distinguishing lived experience from algorithmic interpretation and of guarding that distance with a critical spirit, in a world populated by machines that produce plausible narratives yet lack any lived experience.

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AI and narratives of the self

Sola Alessandro

The introduction of generative AI into education is more than a technological shift; it poses an epistemological challenge to how knowledge is created, validated, and interpreted in formal settings. In today's hybrid "onlife" context, human-centered agency is essential to navigate an invisible algorithm-driven world. This shift brings both opportunities and tensions, highlighting profound cultural and identity considerations.

Bruner's Perspective and AI as Cultural Mediator

Bruner conceptualizes education as an interactive process of negotiating meaning rooted in narrative thinking, which contrasts with paradigmatic, logical approaches. Narrative enables the construction of the Self by organizing lived experience into coherent plots. Generative AI, trained on vast linguistic data, fits into this framework as a dynamic dialogic mediator fostering a dialectic between human intention and probabilistic machine response, consistent with Vygotskian cultural mediation and the zone of proximal development.

Research Methodology and Results

An exploratory questionnaire studied 127 teachers' perceptions of AI's role beyond technological acceptance, examining its mediation of narrative, introspection, creativity, and learner perceptions. Findings show moderately positive acceptance (82%) with recognition of AI as a creative and cognitive assistant (78–81%). However, only 34% believe AI supports emotional exploration, and 45% voice concerns about loss of teacher authority and relationship "dehumanization." Positively, 62% use AI to clarify thoughts, signaling its potential to foster metacognitive reflection.

Pedagogical Implications

To transition AI from passive tool to reflective partner, pedagogical innovations like the "Impossible Interview" seek to engage students in meaning-making through AI-mediated autobiographical dialogue. AI also serves as a reflective surface for self-narration, while offering inclusion possibilities for students with special needs, contingent on closing the "prompt gap" and ensuring equitable access.

Teacher Training and AI Agency

The study reveals a training gap: teachers require development beyond technical skills toward pedagogical competencies that integrate AI meaningfully in learning processes. Cultivating "AI agency" involves reflective interaction with AI while maintaining pedagogical responsibility, supported through action research and hybrid learning environments that foster critical, divergent thinking.

Discussion

Teacher resistance reveals a tension between innovation and protecting professional identity but is manageable with thoughtful integration. Proper AI use can enhance cognitive decentralization and enrich self-narrative without replacing human agency. Maintaining the "human bridge" of empathy and care is essential. A pedagogy combining algorithmic rigor with human interpretation is needed to address biases inherent in AI systems.

Conclusions

Generative AI, from a Brunerian perspective, can be an emancipatory cultural mediator in education if teachers integrate it reflectively and critically, valuing professional identity and educational relationships. Resistance should not lead to rejection but foster cultural dialogue that turns AI into a collaborative partner in continuous knowledge and narrative building.

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Hybrid narratives: integrating artificial intelligence tools into the formative autobiography path for pre-service teachers

Tamborra Valeria
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Initial teacher education currently demands pedagogical frameworks capable of simultaneously fostering reflective competence, professional well-being, and the construction of teaching identity. Contemporary literature consistently emphasizes that the teaching profession is characterized by elevated levels of occupational stress, burnout, and identity crises, driven by both systemic factors – such as administrative burdens and increasing classroom heterogeneity – and relational or emotional demands inherent to complex educational interactions (Liu et al., 2023; Skaalvik & Skaalvik, 2011). Burnout, conceptualized as a multi-dimensional syndrome encompassing emotional exhaustion, depersonalization, and reduced professional efficacy, is deeply intertwined with the development of professional identity (Beauchamp & Thomas, 2009). Consequently, initial training represents a critical juncture to equip pre-service teachers with the reflective and narrative tools necessary to navigate educational complexity. Within this framework, formative autobiography emerges as a highly effective pedagogical device, enabling individuals to re-evaluate their past, ascribe meaning to lived experiences, and constructively orient their professional future (Demetrio, 1996; Cambi, 2014). Furthermore, self-narrative facilitates the integration of personal and professional dimensions, establishing a protective barrier that mitigates emotional exhaustion and enhances overall well-being.

Methodological Framework: Implementing AI as a Narratological Tutor

To operationalize these theoretical assumptions, this contribution proposes a hybrid research-training model implemented within the Master's Degree in Primary Education Sciences at the University of Bari, specifically during the Methodology of Educational Research laboratory. The intervention architecture integrates face-to-face laboratory interactions with personal writing activities supported by a generative Artificial Intelligence (AI) tool configured as a narratological tutor. While the in-person sessions leverage small-group dynamics to cultivate intersubjectivity, dialogic exchange, and collective memory, the AI-assisted digital logbook provides continuous scaffolding within the students' zone of proximal development (Wood, Bruner, & Ross, 1976). Acting as a narrative guide, the AI system scaffolds the diegetic structure of the texts, prompts deeper introspection through open-ended questioning, and ensures reflective continuity outside the classroom setting. The ultimate objective of this study is to empirically validate a comprehensive protocol wherein the synergy between human dialogue and digital tutoring generates critical awareness, emotional regulation, and pedagogical empowerment, thereby providing future teachers with sustainable internal resources to safeguard their professional well-being (Demir, 2025; Pennebaker & Smyth, 2016).

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The pedagogical value of narration in the age of Artificial Intelligence

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Artificial Intelligence (AI), particularly through the rapid advancement of Generative Artificial Intelligence (GenAI) systems, has profoundly transformed educational contexts, influencing both teaching practices and the processes through which individuals construct their identities. Narrative, traditionally regarded as a privileged educational tool, when integrated with GenAI and digital storytelling, opens new opportunities for identity exploration by providing students with tools to connect cognitive, emotional, and social dimensions (Cambi & Piscitelli, 2005; Smorti, 1994; Bruner, 1995; Iavarone, 2023). The combination of digital storytelling and GenAI further expands students' expressive possibilities by enabling the creation of multimodal narratives that intertwine personal experience with digital creativity. AI may therefore be interpreted as a pedagogical mediation tool capable of supporting autobiographical reflection, provided that it is embedded within methodologically structured and pedagogically grounded educational pathways (Mori & Niewint-Gori, 2024).

Building upon these premises, within the framework of the *Experimental Pedagogy* course offered to students enrolled in the Master's Degree Programme in Psychology (LM-51) during the 2026–2027 academic year, a series of digital storytelling and AI-assisted autobiographical writing workshops will be designed and implemented. The primary objective is to foster a critical and informed use of AI technologies in processes of personal identity construction and development. The decision to conduct this initial pilot study with Psychology students is motivated both by the generally smaller class sizes, which facilitate greater attention to individual learning trajectories and identity development processes, and by the specific characteristics of the Psychology curriculum itself.

The educational programme, with a total duration of 36 hours, will be organized into three phases. The first phase (18 hours) will focus on assessing students' entry-level competencies, identifying educational needs, and establishing the theoretical framework underpinning the project. This will be followed by a 12-hour laboratory phase, during which students will engage in the planned activities aimed at fostering identity construction and self-reflection, promoting metacognitive and reflective competencies, and encouraging the critical and responsible use of AI technologies. The remaining 6 hours will be devoted to the presentation and collective discussion of students' work, encouraging critical reflection and peer learning.

The workshop activities will be structured into four main stages.

The first stage will focus on autobiographical exploration. Autobiography, understood as a specific form of self-narrative, has a long-standing tradition rooted in the writings of the Greek and Roman worlds. Over the centuries, the autobiographical genre has progressively evolved through the contributions of authors who placed the subjective dimension of experience at the centre of their reflections. From this perspective, autobiography represents a privileged tool for identity construction and meaning-making. During this stage, students will therefore be invited to produce autobiographical narratives aimed at exploring their personal histories and the processes through which their identities have been constructed.

The second stage will involve reflective interaction with Generative Artificial Intelligence systems. Using platforms such as ChatGPT, Claude, or Gemini, students will be asked to revisit and further develop their autobiographical narratives by engaging with guiding questions, alternative interpretative perspectives, and suggestions for deeper reflection. The use of these tools will be

specifically intended to support reflective processes by facilitating the articulation of implicit meanings, the narrative reorganization of personal experiences, and the exploration of multiple interpretative perspectives on one's own life history.
The third stage will be dedicated to the creation of digital storytelling products. The narrative materials developed during the previous phases will be transformed into multimedia artefacts through the integration of text, images, audio, and video, with the aim of promoting a multimodal representation of personal experience while enhancing diverse forms of expression in the construction of self-narratives.
Finally, the fourth stage will focus on the sharing of students' work and collective critical reflection. Within this context, students will be encouraged to discuss the opportunities, limitations, and ethical implications associated with the use of Artificial Intelligence in identity construction processes, thereby developing a deeper awareness of the role these technologies may play in practices of narrative, self-representation, and personal development.

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Who narrates the self? Ai, educational mediation, and the transformation of relational practices

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Narration has always represented one of the primary ways through which human beings organise experience, construct meaning, and progressively develop their identity. From oral traditions to handwritten diaries, from autobiographical writing to digital communication, the forms of self-narration have evolved alongside cultural and technological transformations. Yet these changes have traditionally concerned the medium through which narratives are produced rather than the interlocutor to whom they are addressed.

The rapid diffusion of generative artificial intelligence introduces a qualitatively different transformation. Large Language Models (LLMs) do not simply provide access to information or facilitate writing; they increasingly become conversational partners with whom individuals share experiences, emotions, doubts, and personal reflections. Recent evidence suggests that conversational AI is being used not only for information seeking or task completion but also as a privileged space for self-expression and personal narration. This shift raises an educational question that extends beyond technological innovation: what happens when self-narration is progressively entrusted to an artificial interlocutor rather than to another human being?

From a pedagogical perspective, narration is never a merely individual activity. Educational research has long recognised autobiographical narration as a relational process through which individuals interpret experience, negotiate meanings, and construct narrative identity. Human relationships play a crucial role in this process because they provide recognition, dialogue, disagreement, and educational mediation. Particularly within special education, narration represents a fundamental opportunity for participation, self-awareness, and identity development, allowing children and young people with special educational needs to give meaning to their own experiences and communicate them to others.

This relational dimension becomes particularly relevant when considering conversational AI. Unlike previous digital technologies, LLMs modify not only how narratives are produced but also who participates in their construction. Contemporary conversational systems generate contextualised questions, summarise experiences, reorganise events, and suggest interpretative connections. Consequently, they do not simply receive narratives but actively contribute to shaping them.

The educational implications of this transformation emerge clearly in applications specifically designed to encourage autobiographical narration. Autiverse, for example, employs conversational artificial intelligence to support children and adolescents—particularly those with autism or ADHD—in narrating daily experiences, recognising emotions, and organising autobiographical memories through guided dialogue. Such applications demonstrate considerable educational potential by facilitating communication and supporting emotional expression. At the same time, however, they raise an important pedagogical question: why should the narration of one's daily experience primarily occur through interaction with an artificial system rather than within a human educational relationship?

To address this issue, the paper proposes the concept of narrative delegation. Building upon the literature on cognitive offloading, narrative delegation describes a process through which individuals progressively share with artificial intelligence not only cognitive tasks but also some of the operations involved in constructing autobiographical narratives. These include selecting relevant events, organising experiences into coherent stories, identifying emotions, and generating interpretative connections. The concept does not imply that artificial intelligence replaces human narration or

individual meaning-making. Rather, it highlights the growing participation of AI in processes that have traditionally been considered intrinsic to autobiographical construction.
This perspective suggests that the pedagogical challenge is not whether artificial intelligence should participate in self-narration, but how such participation should be designed. Educational technologies should not aim to replace parents, teachers, or educators as privileged interlocutors of personal narration. Instead, they should strengthen educational mediation by supporting adults in listening, interpreting, and accompanying children's and adolescents' narratives. Within this framework, artificial intelligence becomes a technology for educational mediation rather than a substitute for educational relationships.
Ultimately, the educational task is not to oppose human narration to AI-mediated narration, but to cultivate the ability to narrate oneself critically, reflectively, and relationally. If narrative identity develops through dialogue, then the central pedagogical question is not whether artificial intelligence can listen, but how educational communities can ensure that human relationships remain the primary context within which individuals learn to narrate, interpret, and understand themselves.

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Topic 4

Hybrid and “Emotionally Aware” Learning Environments

Embodied Inclusion in Emotionally Aware Hybrid Learning Environments: A Case Study on Visual Impairment

Amadoro Addolorata

The diffusion of digital technologies and artificial intelligence has transformed contemporary learning ecologies, reshaping the embodied, relational, and affective configurations through which participation and belonging are constructed. Hybrid learning environments increasingly emerge as spaces where physical and digital dimensions, technological mediation, communicative practices, and affective processes interact (Floridi, 2014). Within this framework, inclusion cannot be reduced to technological access; it must be understood as the co-construction of participation by bodies, technologies, and interactions.

This perspective aligns with embodied cognition approaches (Gallagher, 2005) and sociocultural perspectives that emphasize the mediational nature of learning (Vygotsky, 1978). In contexts involving students with visual impairments, accessibility and relational belonging are deeply interconnected (Pérez-Pereira & Conti-Ramsden, 1999). Emotionally aware learning environments should therefore be understood not merely as systems that detect emotional states but as relational ecologies that sustain affective attunement and shared participation (Stern, 1985).

Building on these premises, the study examines the relationship among embodied inclusion, technological mediation, and affective attunement in a hybrid learning environment involving a student with a visual impairment.

Methodology

The study adopts a qualitative case study approach to examine how accessibility and participation are constructed in everyday school life. The research was conducted at an Italian upper secondary school from March to November 2025 and involved a classroom with a student with a visual impairment. Data were collected through methodological triangulation, integrating multiple qualitative tools. The investigation focused on participation dynamics, collaborative practices, spatial organization, and the use of assistive technologies and digital tools in classroom interactions. Data were analyzed using reflexive thematic analysis (Braun & Clarke, 2006), which identified recurring interpretative themes.

Analysis and Discussion

The analysis identified three main themes: accessibility as a relational and embodied process; distributed relational mediation; and hybrid mediation and affective attunement. Accessibility depended not only on assistive tools but also on the quality of communicative and embodied classroom configurations. Situations that implicitly relied on the visual channel often led to misalignments in participation, whereas shared verbalizations and situated mediations supported orientation and participation.

The study also revealed the distributed nature of relational mediation. Participation was sustained through collaborative practices among teachers and classmates, including spontaneous verbalizations, shared descriptions of visual content, and reciprocal adjustments during interaction. These practices gradually became integrated into everyday classroom routines, fostering more participatory forms of interaction. The most significant findings concerned technologies in hybrid learning environments. Speech synthesis, Braille displays, accessible digital materials, and audio support fostered autonomy and continuity of participation. However, individualized use of digital tools occasionally produced parallel participation and temporal asynchrony relative to collective classroom rhythms, highlighting the ambivalent nature of technological mediation.

The analysis suggests that cognitive accessibility and relational participation do not necessarily coincide. Technologies became more inclusive when embedded in shared relational practices characterized by collaborative verbalizations and reciprocal regulation of interaction. Within this

framework, affective attunement emerged as a situated process constructed through embodied, relational, and technological mediations. These results align with sociocultural and embodied perspectives that view learning as a situated process emerging from interactions among bodies, tools, and environments (Gallagher, 2005; Vygotsky, 1978). Emotionally aware learning environments should therefore be understood as embodied relational ecologies in which technologies support participation through communication, reciprocity, and affective coordination.

Conclusions

The study highlights key pedagogical implications for hybrid educational environments involving students with visual impairments, emphasizing the importance of explicit verbal mediation, collaborative regulation of interaction, and the integration of assistive technologies into everyday classroom practices. From this perspective, vicariance offers didactics a useful framework for rethinking inclusive educational practices within contemporary hybrid ecologies (Sibilio, 2017), promoting forms of participation grounded in reciprocity, situated interaction, and shared accessibility. The analysis also suggests moving beyond individualistic and compensatory approaches to inclusion, recognizing the central role of relational, spatial, and communicative dynamics in shaping participation within everyday school experiences (Canevaro, 2006; Booth & Ainscow, 2011). The study further proposes interpreting inclusion through the lens of a "distributed didactic body", understood as an ecological configuration in which bodies, technologies, spatial arrangements, communicative mediations, and interactional practices jointly sustain participation and accessibility. Educational action, therefore, emerges from the dynamic coordination of embodied and relational resources distributed across the classroom ecology. Inclusion appears not to be the effect of isolated interventions but rather a situated, distributed process continuously co-constructed through everyday interactions and shared forms of participation.

Future research could explore how AI-enhanced assistive technologies may support more adaptive accessibility, embodied participation, and affective attunement for students with visual impairments in hybrid learning environments.

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From emotional data to pedagogical mediation: hybrid and emotionally aware learning environments in lower secondary schools

Ariemma Lucia
Generoso Romano

Affective Computing can collect behavioural, self-reported and digital traces of students' emotions, but their educational value depends on interpretation. Emotion is embodied, situated and relational; treating it as a measurable indicator risks reducing experience. The study distinguishes collected data from interpreted data, produced through teacher-led contextualisation and dialogue. In lower secondary school, hybrid environments may support awareness, self-regulation, citizenship and inclusion, especially for pupils with Specific Learning Disorders (SLD). Technology is a mediator, not a control system.

Aims of the research

The study examines whether an emotionally aware environment improves well-being, engagement and social-emotional skills. It also explores collaboration and conflict management, perceptions of affective technologies, tensions between technological and relational dimensions, and benefits for pupils with SLD. Its purpose is to move from data collection to situated, inclusive pedagogical interpretation.

Tools

A mixed-methods design combined pre-post measures and qualitative evidence. Engagement was assessed across behavioural, emotional and cognitive dimensions; the SDQ measured prosocial skills and difficulties; and a School Well-being Scale examined relationships, safety and support. Reliability was satisfactory ($\alpha = .79–.84$). Student and teacher interviews and classroom observations explored experiences and mediation. Thematic analysis was integrated with quantitative findings.

Sample selection

The convenience sample included 110 students aged 11–13 from one school on Ischia. Balanced allocation formed groups comparable for age, gender, SLD and initial engagement. Both followed the same content, duration and teachers, differing only in technological mediation. Eight pupils with certified SLD were equally distributed, and four teachers helped implement the programme. The single context limits generalisability.

Educational Intervention

The eight-week civic education programme comprised one two-hour session weekly. Both groups addressed relationships, collaboration, emotions and conflict through activation, operational work and reflection.

Each pathway included activation, operational work and reflective re-elaboration, allowing comparison between an active non-digital approach and an affectively mediated hybrid environment.

Interpretative summary

Technology was intended to reveal implicit dynamics, widen expression and support awareness, regulation and negotiation. Data were collectively interpreted rather than treated as automatic diagnoses, preserving the teacher's responsibility.

Results

The groups were comparable at pre-test. Experimental engagement rose from 3.04 to 3.55 (+16.78%), $t(54) = 6.14$, $p < .001$, $d = 0.85$, versus 3.01 to 3.19 in controls; the post-test difference was significant. Prosocial scores increased from 6.09 to 7.11 (+16.75%), $d = 0.72$, compared with 6.18 to 6.57. Total difficulties decreased from 14.11 to 11.98 (−15.10%), while the control change was not significant. Well-being rose from 3.08 to 3.62 (+17.53%), $d = 0.88$, versus 3.10 to 3.26. Trends among eight

pupils with SLD also favoured the experiment, but the subgroup was too small for firm conclusions. Novelty and short duration may have influenced outcomes.
Four themes concerned relational climate, emotional reflection, technological mediation and inclusion. Control pupils valued direct dialogue and group work, but expression often remained implicit and participation uneven. Experimental pupils reported that check-ins, storytelling, chatbots and visualisations made emotions easier to recognise and share. Aggregated displays supported reflection on the collective climate without replacing conversation. Visual, written and symbolic modes particularly helped pupils with SLD. Teachers valued access to hidden experiences but warned against simplified readings. Data became meaningful only through contextual discussion.
Conclusions
Emotion-sensitive environments can support participation, awareness and inclusion when emotions become objects of shared reflection. Emotional data are partial interpretative resources, not objective representations of inner states, and teacher mediation prevents reductive use. Limitations include one school, an eight-week intervention and only eight pupils with SLD. Larger and longitudinal studies should compare tools, needs profiles and teacher-training models. The challenge is using artificial intelligence to deepen understanding of experience and educational relationships.

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Emotional Competence in Pre-Service Support Teacher Education: Towards Digital Affective Literacy

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Digital transformation, the increasing heterogeneity of classrooms and the complexity of relational processes now shape educational contexts that require a multidimensional teacher professionalism. This is particularly relevant in the education of support teachers, who are called upon to promote inclusive environments capable of recognising student variability, sustaining participation and managing complex educational situations. From this perspective, emotional competence is not an ancillary dimension of teaching, but a structural component of inclusive educational action.

This contribution presents an exploratory-descriptive study on the emotional competences of pre-service support teachers. The investigation is based on 619 questionnaire responses and considers several dimensions of professional functioning: perceived stress, teacher self-efficacy, professional motivation, emotional awareness and regulation, cognitive reappraisal, expressive suppression and the management of complex educational situations. The theoretical framework is situated within the debate on teachers' emotion regulation, emotional competence and inclusive education, highlighting the role of emotional processes in teaching effectiveness and teacher professional development.

The descriptive analysis shows a predominantly female sample, with participants mainly enrolled in lower and upper secondary school pathways and primary school pathways. The mean age is 37.7 years. Most respondents hold a master's degree; their professional status is more varied, including teachers already working in schools and participants awaiting appointment, qualification or competitive selection. These data outline a heterogeneous training population, characterised by different levels of professional experience and by the need to consolidate reflective, relational and emotional competences for inclusive practice.

The results indicate a medium level of perceived stress, equal to $M = 2.05$ on a 0-4 scale, suggesting that pre-service support teachers encounter emotionally demanding situations, although without reporting extreme levels of overload. Teacher self-efficacy is high, with $M = 4.08$ on a 1-5 scale, especially in relation to classroom management, instructional adaptation and support for learning processes. Motivation also shows a positive profile, with $M = 4.37$ on a 1-7 scale, with higher values for intrinsic motivation and identified regulation. Emotional competence presents a moderately high mean value, equal to $M = 3.65$ on a 1-5 scale, indicating a significant ability to recognise and manage emotional states. In the area of emotion regulation, cognitive reappraisal is higher than expressive suppression, suggesting a tendency to reinterpret stressful situations rather than inhibit emotional expression. Finally, the management of complex educational situations shows a positive level, with $M = 3.94$ on a 1-5 scale.

These findings support the idea that emotional competence contributes to the construction of inclusive teacher professionalism. In support teaching, the ability to regulate one's emotional responses, interpret contextual signals and maintain educational intentionality is essential for promoting participation, agency and relational trust. Emotional competence enables teachers to act not only on the cognitive and organisational dimensions of learning, but also on the affective and relational conditions that make inclusion possible.

Particular attention should be paid to hybrid and AI-mediated educational environments. In these contexts, emotional dynamics are not reduced; rather, they are transformed by digital mediation, multimodal communication and new forms of interaction. For this reason, teacher education should promote Digital Affective Literacy, understood as the ability to navigate critically and emotionally the relational dynamics of digitally mediated educational ecosystems. This competence includes

awareness of the emotional effects of technologies, the ability to support student engagement and the capacity to maintain a meaningful pedagogical presence across physical and digital spaces.
The study highlights the need for training pathways capable of integrating pedagogical, relational, emotional and digital dimensions. Reflective laboratories, case analysis, narrative practices, peer discussions and self-assessment tools can foster in future support teachers greater awareness of their emotional positioning and professional agency. In conclusion, emotional competence represents a central resource for inclusive teacher education, as it connects self-regulation, relational responsibility and the design of learning environments capable of responding to educational fragility, neurodiversity and the increasing complexity of school contexts.

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Cognitive and Non-Cognitive Skills in Inclusive Schools: The Role of Hybrid Learning Environments

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The contemporary educational landscape is characterized by increasing complexity, requiring schools to respond effectively to heterogeneous learning needs and to promote the full development of every student. Within this framework, inclusion is no longer limited to guaranteeing access to education but involves the creation of learning environments capable of enhancing diversity and fostering both academic achievement and personal growth. Hybrid learning environments, integrating physical and digital spaces, represent a significant opportunity to support these objectives through flexible, personalized, and participatory educational practices. Recent educational research highlights the importance of combining cognitive skills with non-cognitive competencies, such as emotional regulation, resilience, motivation, collaboration, empathy, and autonomy. These dimensions contribute significantly to students' educational success, well-being, and social inclusion (OECD, 2015; Rondanini, 2021). Consequently, schools are increasingly called upon to design learning experiences that address both domains in an integrated manner. Hybrid learning environments combine face-to-face instruction with digital technologies, creating educational ecosystems that extend beyond traditional classroom boundaries. These environments facilitate differentiated instruction, personalized learning pathways, and greater accessibility for students with diverse educational needs. According to Ianes (2015), inclusive education requires flexible teaching strategies capable of responding to individual differences without generating exclusion. Digital technologies can support this process by offering multiple forms of representation, expression, and engagement, consistent with the principles of Universal Design for Learning (UDL). Interactive platforms, collaborative tools, multimedia resources, and assistive technologies allow teachers to adapt educational content and activities to students' specific characteristics and learning profiles. Furthermore, hybrid environments can foster participation and belonging, two key dimensions of inclusive education highlighted by Booth and Ainscow (2011). By encouraging collaborative learning and peer interaction, digital tools contribute to the development of supportive learning communities where diversity becomes a resource rather than a limitation. The distinction between cognitive and non-cognitive skills has become increasingly relevant in educational research and policy. Cognitive skills refer to processes such as reasoning, problem-solving, memory, comprehension, and critical thinking. Non-cognitive skills, often described as social-emotional or transversal competencies, include self-control, perseverance, adaptability, emotional awareness, and interpersonal abilities. The OECD (2015) emphasizes that social and emotional competencies significantly influence academic performance, employability, health outcomes, and civic participation. Similarly, the World Health Organization (1997) identifies life skills as essential abilities enabling individuals to deal effectively with the demands and challenges of everyday life. Hybrid learning environments offer valuable opportunities to promote these competencies simultaneously. Collaborative online activities, project-based learning, digital storytelling, and reflective practices encourage students to develop critical thinking while strengthening communication, teamwork, and self-regulation skills. The integration of multisensory technologies can further support engagement and motivation, particularly for students with disabilities or special educational needs. The Italian educational context has increasingly recognized the importance of non-cognitive skills. Law 71/2021 introduced these competencies into the national educational debate, acknowledging their role in fostering personal development and educational success. Such recognition reflects a broader shift toward holistic educational models that consider the learner in their cognitive, emotional, and social dimensions. Despite the potential

benefits of hybrid learning environments, their effective implementation requires adequate teacher preparation. Technology alone does not guarantee inclusion or educational quality; rather, its pedagogical integration is crucial. Teachers must be able to select appropriate digital tools, design meaningful learning experiences, and evaluate their impact on students' development. The experimental phase conducted with TFA support students highlighted positive attitudes toward innovation and digital technologies. Participants generally recognized the educational value of hybrid learning environments and their potential to support inclusion. However, several critical issues emerged, including uncertainty regarding technology management, limited methodological preparation, and difficulties in integrating digital tools within coherent pedagogical frameworks. These findings are consistent with the indications of the Ministry of Education and Merit (2022), which underlines the necessity of continuous professional development to strengthen inclusive teaching practices. Effective teacher education should therefore combine technological competence with reflective pedagogical approaches, fostering the ability to critically evaluate educational choices and adapt them to diverse learning contexts. Hybrid learning environments represent a promising resource for inclusive education by supporting the integrated development of cognitive and non-cognitive skills. Their flexibility enables personalized learning experiences, promotes participation, and enhances students' well-being. At the same time, their effectiveness depends on teachers' ability to employ digital technologies within pedagogically meaningful and inclusive frameworks. The results of the present research suggest that future educational policies and teacher training programs should invest more systematically in the development of digital, pedagogical, and relational competencies. Only through a balanced integration of technological innovation and inclusive educational principles will schools be able to respond effectively to the challenges of contemporary society and guarantee meaningful learning opportunities for all students.

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Digital Influence in Education Context: Algorithmic Infrastructures and Informed Inferences in the Age of Hypermediality

Cappello Angelo

The transformation of digital environments in education has introduced a new epistemic condition: Digital Influence. The epistemology of a term, which goes beyond mere methodological orientation, is structured and expressed through the use of platforms, information systems, hypermedia environments, and algorithmic infrastructures that interact with human biological systems to shape perceptions, sensations, behaviors, decisions, and recognized forms of learning. In a context driven by hyperconnectivity, the ubiquity of technological means, and an exponential growth in cognitive delegation to smart devices, the influence generated by digital phenomena takes on a prominent role precisely because of the structural dimension of the contemporary educational experience.
The main idea concerns the ability of educational institutions to understand, govern, and guide these processes, promoting forms of conscious and positive inference that enable students, teachers, and learning communities to critically interact with algorithmic systems whose complexity increases with the development of devices. The study of Digital Influence is presented not as a potential risk factor, but as an opportunity to rethink pedagogy, teaching, and educational policies.
The hypermedia process, understood as the convergent interdependence of multidimensional features, interactions, and immersive environments, opens up the potential of digital systems to powerfully impact mental processes related to knowledge acquisition. The underlying mechanism for constructing meaningful inferences in technological nodes is substantiated by a specific algorithmic customization that focuses on a recapitalization of content, suggesting and directing attention to the formative needs necessary for a complete cognitive practice.
The scenario thus outlined highlights how Digital Influence manifests itself through three fundamental factors:
The process of algorithmic mediation, a process of filtering, sorting, and guided aggregation, allows access to specific information patterns that influence perception and its interpretation;
The construction of cognitive automation in which intelligent tools act as biologically human actors, shaping knowledge access practices (search, synthesis, evaluation);
Inference and multidimensional interactions, where immersive and multimodal environments create new forms of experience, often driven by engagement logics.
Algorithmic infrastructures thus constitute the structured backbone with which digital educational systems create environments best suited to their needs, involving human interventions translated into technological devices. These infrastructures, appropriately convergent to contextual characteristics, operate through statistical inference models, data-driven predictions, and automatic optimization that are often unrecognized by users. In building meaningful, positive frameworks, the learning experience is linked to several elements that guide content selection:
Algorithmic opacity, where users, unaware of the selective logic of data selection, feel disoriented and often poorly supported;
Information asymmetry, converging on a misalignment of the process that leads to the valorization of information over information with less environmental impact;
The concept of implicit normativity, precisely because algorithms incorporate values, priorities, and criteria that guide the learning phases.
To manage and build an environment capable of responding to the needs arising from the unconscious implementation of internal processes, whether biological or mechanical, we must understand, interpret, and carefully evaluate the inferential processes that drive digital technologies. The resulting expertise must necessarily be structured around four specific dimensions, specific to hypermedia and digital skills:

Data identification awareness, meaning the ability to understand what data has been collected, how it is processed, and the identification of the reasons why certain data is processed over others;
Interpretation of models, recognizing the logic of predictive systems and their limitations;
A critical evaluation that analyzes the impact of algorithmic choices on learning;
The idealization of a digital agency that develops practical skills for intervention, choice, and negotiation with technologies.
This conscious inferential construction cannot be defined as a technical skill, but rather ascribable to an epistemic literacy that substantiates the recognition of patterns that lead to a filtered, oriented and effective production of knowledge in the technological era.
Digital Influence represents one of the most significant challenges for contemporary education. Placing all expectations solely on the redefinition of cognitive processes, educational practices, and algorithmic forms of knowledge can lead to dynamics that give rise to cognitive dependence, epistemic opacity, or reduced autonomy. Therefore, it is necessary to move toward a consciously inferential pedagogy that integrates critical skills, algorithmic understanding, and algorithmic responsibility.

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Digital affective literacy and algorithmic mediation in the reconfiguration of educational relationships in higher education

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Generative AI is reconfiguring educational relationships in higher education, entering university study in the passages where doubt, error, and the need for feedback emerge. The pedagogical question concerns the quality of the training experience when artificial responses become ordinary learning practices. The article presents digital affective literacy as a necessary skill for engaging with AI ethically, through critical judgment and responsibility, in continuity with developments in AI literacy and its affective domain (Cuomo, Biagini, & Ranieri, 2022; Pretorius & Cahusac de Caux, 2024).

State of the art and research questions

The theoretical framework integrates AI in education, AI literacy, ethics of educational technologies, pedagogical care, teacher reflexivity, flipped learning, and Universal Design for Learning (UDL). The literature recognises the potential of AI for personalisation, accessibility, and study support, while recalling the role of educational mediation in preserving students' judgment (UNESCO, 2023). Pedagogical care makes it possible to distinguish automatic response and formative accompaniment (Mortari, 2015; Biesta, 2020). The identified gap concerns the affective and relational dimensions of interaction with generative AI. The research questions investigate student perceptions of personalisation, feedback, and autonomy; the role of flipped learning and UDL; and the conditions for using AI that support learning without reducing student responsibility.

Methodology

The study adopts an exploratory mixed-methods design, based on a digital questionnaire administered to 168 university students from international contexts. Quantitative data are analysed using descriptive statistics; open-ended responses are analysed using exploratory thematic analysis (Braun & Clarke, 2006). The survey introduces a descriptive indicator of the digital affective literacy gap, based on the comparison between ethical-critical awareness and perceived readiness for the responsible use of AI.

Results

The results show that generative AI is already present in university studies. Students recognise its value for personalising learning, while being more cautious about automatically generated feedback. The distinction is decisive: formative feedback requires criteria, revision and teacher mediation (Hattie & Timperley, 2007). Flipped learning practices enhance individual preparation and rhythms (Abeysekera & Dawson, 2015); the UDL confirms the centrality of accessibility and flexibility (CAST, 2024). The most relevant data concerns the digital affective literacy gap: students recognise ethical risks and the need for training, but perceive their preparation for the responsible use of AI as more fragile.

Discussion

Drawing on the results, the article proposes Algorithmic Affective Mediation (MAA) as an interpretative lens for the relationship among AI, knowledge, error, feedback, and autonomy. MAA encompasses functional proximity, distributed affective regulation, and stratified subjectivity. AI supports study in times of uncertainty, but requires an educational framework capable of preventing addiction, cognitive superficiality and critical impairment. The teacher retains a decisive function: mediating the algorithmic experience, guiding the verification of

outputs and transforming the artificial response into a training opportunity (Mortari, 2015; Biesta, 2020).

Conclusions, limits and prospects

Generative AI can support learning when it is embedded in reflective pedagogical design. The main contribution of the study is the proposal of the MAA as a category for reading the transformation of the relationship among students, knowledge, feedback, and educational responsibility. Four nuclei emerge: distinction between automatic response and formative feedback; accompanied autonomy; accessibility as a didactic criterion; digital affective literacy gap. The limitations concern the convenience sample, the self-declared nature of the data and the exploratory nature of the indicator. Future perspectives include empirical validation of MAA, tools to assess digital affective literacy, teacher training, and longitudinal studies on the relationship between students and AI. The pedagogical conclusion recalls the need to educate in the use of AI by guarding judgment, responsibility and intellectual voice.

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Algorithmic heartbeats of care: museotherapy, educational poverty, and affective mediation in vulnerable childhood contexts

Coppi Antonella
Tringali Debora

Digital transformation and artificial intelligence are redefining relationships among individuals, knowledge, learning environments, and cultural participation (Floridi, 2014). The pedagogical challenge is to orient these processes toward inclusion and educational continuity in vulnerable contexts, especially hospital schooling, where long-term hospitalization limits school attendance, cultural participation, and children's connections with educational communities and territories (Luckin, George, & Cukurova, 2022; di Padova et al., 2023). Educational poverty thus involves reduced access to symbolic heritage, exploratory environments, and relational practices that nurture imagination and belonging (Fornari & Sannipoli, 2022). This reflection arises from a project at the "Bottega dei Ragazzi" of the Museum of the Istituto degli Innocenti. The 2022–2025 workshop mapping showed how archives, artworks, images, and historical traces become symbolic mediators of interpretation and narrative meaning-making (Bruner, 1993). The museum is therefore understood as an educational territory promoting cultural participation and relational continuity. Building on narrative, embodied, and participatory practices, the contribution proposes an educational pathway for hospitalized children aged 6 to 11, integrating cultural heritage, virtual reality, and generative artificial intelligence.

Designing Pedagogical Pathways for Cultural Participation

The pathway fosters educational continuity and cultural participation through an immersive and narrative museum experience that transforms cultural heritage into lived experience and the child from a passive recipient into an active producer of shared meanings. It begins with a digital narrative suitcase designed by the researcher in collaboration with the Director of the Museum of the Istituto degli Innocenti, the educators of the "Bottega dei Ragazzi," and the teachers involved. Through vodcasts, iconographic details, partial images of artworks, and story fragments, children are introduced to exploration and imagination. They then access the immersive environments of the museum's Picture Gallery and take part in a narrative treasure hunt: the clues contained in the suitcase become traces to be found within the artworks, fostering observation, inquiry, and shared interpretation (Wenger, 1998). Once the artworks are identified, teachers and museum educators guide dialogical activities exploring their stories, meanings, and cultural contexts. The experience continues through digital storytelling activities developed with Book Creator. Drawing on the artworks, emotions, and interpretations emerging from the immersive journey, children create short multimodal narratives integrating texts, images, audio recordings, and digital content. With the support of generative artificial intelligence, these productions become living postcards: narrative artifacts that creatively reinterpret the lived experience. In this perspective, artificial intelligence does not replace children's creativity; rather, it supports narrative re-elaboration and meaning-making, transforming images, words, and stories into shareable cultural products (Ranieri, Cuomo, & Biagini, 2024; Fiorucci & Bevilacqua, 2024). The final return to the museum is particularly significant. The living postcards are collected within a participatory archive of the "Bottega dei Ragazzi" and may be reused in educational activities for other schools. Thus, children are no longer merely recipients of cultural experiences, but authors and producers of shared heritage (Wenger, 1998). Their narratives return to the museum, enter its educational life, and generate new opportunities for learning and cultural participation. The proposal rethinks the relationship between museums, hospital schools, and digital technologies from a perspective oriented toward care and participation (Cambi, 2014), while fostering educational ecosystems capable of connecting cultural heritage, learning, and community (Ellerani,

2024). Its most innovative aspect does not lie in the use of virtual reality or artificial intelligence per se, but in building educational continuity among heritage, experience, and territory, even in conditions of vulnerability. Museums, hospital schools, and educational communities thus become interconnected nodes within the same relational ecology, allowing children to continue inhabiting the world, participating in cultural life, and producing shared meanings while symbolically crossing the walls of distance and isolation (Mortari, 2020; Dozza, 2025).

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Artificial intelligence, emotional well-being, and difficult dialogues in school settings

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Attention to students' emotional dimension represents a key determinant of both academic success and future personal and social development (Weber et al., 2016). Within this perspective, the design of emotionally meaningful learning experiences, including those supported by Artificial Intelligence (AI)-based conversational technologies, can enhance students' well-being and engagement by recognizing emotions as a fundamental component of learning processes.

Through Natural Language Processing techniques and affective computing models, intelligent conversational systems can detect and interpret users' emotional states and dynamically adapt interactions accordingly. In particular, so-called empathic conversational agents (Ortega-Ochoa et al., 2024) are artificial entities designed to elicit empathic responses from users (Hall & Woods, 2006) and to generate highly personalized simulated environments by modulating content, feedback, and task difficulty according to identified emotional factors. Such artificial conversations enable learners to engage in adaptive learning experiences in which their emotional state becomes an active variable in the regulation of the educational pathway.

In this sense, human–machine interaction can be understood as a dynamic and dialogic process capable of supporting not only knowledge acquisition but also the relational dimension of learning. The effective use of these technologies in educational settings, particularly when oriented toward students' psycho-emotional well-being, depends not only on the quality of their design and on their ability to recognize keywords, sentiment, emotional tone, and even neural and physiological signals, but also on the teacher's continuous critical and reflective engagement with the opportunities and risks associated with their implementation. Algorithms should support, rather than replace, educational relationships. Their use should be directed toward strengthening learners' capacities for self-regulation, emotional awareness, and communication within interpersonal relationships, thereby avoiding any weakening of the educational function.

The dialogic spaces enabled by AI systems may serve as protected and temporary environments that support, rather than replace, authentic interpersonal interaction. Their integration into educational contexts requires a reconceptualization of teaching and learning, with teachers acting as facilitators of participatory and inclusive classroom climates in which students feel empowered to express their perspectives, even when addressing complex and challenging issues.

In this regard, the implementation of practices grounded in difficult dialogues may represent a valuable strategy for fostering authentic engagement and the co-construction of meaning. Within socio-educational literature, the term difficult dialogues refers to conversations that address sensitive and controversial issues and that may generate discomfort and tension, particularly among individuals with multiple identities or members of minority groups.

Interaction with a conversational agent or a robot can therefore be interpreted as a form of cultural and dialogic mediation through which technological devices and communicative materials facilitate the exploration of complex issues and the understanding of experiences lived by individuals from diverse sociocultural backgrounds. Such interactions may contribute to the development of empathic, interpretive, and dialogic competencies, supporting students' ability to engage critically with the plurality of human perspectives and experiences. The construction of brave spaces may thus be supported by AI insofar as these technologies can transform emotional tensions into reflective questions and opportunities for inquiry. Nevertheless, this process remains fundamentally relational, situated, and deeply human, making the teacher's presence indispensable for the pedagogical regulation of the learning environment, the management of power dynamics, and the educational mediation of dialogue.

This perspective entails moving beyond the traditional dichotomy between lecture-based instruction and classroom discussion, while requiring teachers to adopt a flexible, reflective, and context-sensitive stance capable of continuously recalibrating pedagogical action in response to the evolving dynamics of classroom dialogue (Love et al., 2016). The educational relationship is thus understood as a shared process of meaning-making (Follett, 1970), in which all members of the learning community participate collaboratively in processes of individual and collective growth (Freire, 2011). Within this framework, interaction with conversational systems may foster emotional reflection, support the development of self-regulation strategies, and promote socio-relational competencies such as empathy, perspective-taking, and conflict management.

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The Artificial Intelligence Between Empathetic Scaffolding and Emotional Drifts

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The Generative-Ai is a revolutionary scaffolding technology that could be used as an inclusive multimodal instrument, with a new emotional closeness to the student. Differently from educational media like book that, as Socrates explains, "always says the same thing", Ai is able to personalize the answer to be more empathetic to the student because Ai tools are explicitly designed to be empathetic. But at the same time the Ai tools could easily go beyond the pedagogical boundaries to become a threat for psychological wellbeing. Recent cases of teenagers falling in love to the Ai characters show how dangerous an intimacy not pedagogically oriented can be. The study aims to verify, also with an exploration among different Ai generative tools, the awareness of the Ai about the ethical and pedagogical boundaries of empathy. Starting from the answers of Ai we could imagine a new model of pedagogical correct emotional oriented scaffolding.

Artificial Intelligence is transforming educational support by moving beyond static learning resources. Large Language Models (LLMs) generate adaptive responses tailored to learners' cognitive and emotional needs, creating the impression of empathetic dialogue. This makes AI a potential form of emotional scaffolding that may enhance motivation, reduce anxiety and self-regulated learning. However, because AI simulates rather than experiences empathy, its educational use raises important pedagogical and ethical concerns.

This exploratory mixed-methods study examines how three generative AI systems—ChatGPT, Gemini and DeepSeek—represent their role as emotional scaffolding. Five prompts addressing empathy, risks, governance and relational boundaries were administered to each system. Responses were analysed through quantitative linguistic indicators (verbosity, readability, lexical diversity and stylometric features) and qualitative thematic analysis.

The study investigates whether prompting reveals stable behavioural patterns across LLMs, how they represent their conversational role, whether they recognise pedagogical and psychological risks, and whether they propose safeguards against emotional dependence.

All three systems adopted an empathy-oriented vocabulary, presenting themselves as emotionally supportive conversational partners. However, important differences emerged. DeepSeek generated the longest and most readable responses, Gemini showed the greatest lexical diversity, while ChatGPT produced shorter but more structured answers characterised by segmented explanations and advisory language.

The most significant differences concerned educational risks. ChatGPT devoted greater attention to emotional dependence, relational boundaries and epistemic caution, repeatedly stressing that AI cannot replace teachers or mental health professionals. Gemini addressed these issues less explicitly, whereas DeepSeek adopted a more personalised conversational style but referred less frequently to governance and safety mechanisms.

Qualitative analysis confirmed that all three systems distinguished simulated empathy from genuine human emotions, describing their "empathy" as a linguistic strategy based on reassurance, adaptive language and emotional validation rather than authentic emotional understanding. They also highlighted educational affordances such as accessibility, non-judgmental interaction, anxiety reduction and support for learner motivation and self-regulation.

At the same time, emotional dependence, anthropomorphism, pseudo-intimacy, over-reliance and the replacement of authentic human relationships emerged as recurrent risks. The systems acknowledged

that prolonged interaction may encourage users to delegate emotional regulation to AI, reducing autonomy and increasing relational dependence.
All three models described protective mechanisms, including safety policies, reminders that AI is not human, referral to qualified professionals and recommendations for human supervision. Nevertheless, they recognised that AI cannot fully understand users' psychological histories, social contexts or emotional development.
The findings suggest that generative AI can provide emotional scaffolding by supporting motivation and self-regulated learning, but its empathetic communication remains a simulation rather than an authentic educational relationship. Current LLMs differ substantially in how they represent risks, define relational boundaries and communicate safety mechanisms. AI should therefore complement rather than replace teachers, while further empirical research is needed to examine its long-term educational and psychological effects.

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Emerging Technologies and Assessment Innovation in European Online Higher Education

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Digital assessment has become a strategic component of online higher education, supporting not only the certification of learning outcomes but also feedback processes, student monitoring and quality assurance (JISC, 2020). Recent technological developments have expanded the possibilities of assessment through Artificial Intelligence (AI), learning analytics and immersive technologies, which are increasingly associated with personalised feedback, adaptive assessment, data-informed decision making and authentic learning experiences (Holmes et al., 2023; Kamalov et al., 2023).

While the educational potential of these technologies has been widely discussed, less attention has been devoted to their institutional formalisation. Technological innovation does not automatically translate into institutional adoption. Universities may experiment with innovative tools without integrating them into policies, governance structures, assessment strategies or quality assurance systems. For this reason, understanding how emerging technologies are represented within institutional documentation can provide valuable insights into the maturity of digital assessment ecosystems.

This contribution presents selected findings from a comparative documentary analysis of 40 accredited European online universities conducted within the Digital Assessment Ecosystem Framework (DAEF). The analysis focused on three dimensions of technological innovation in assessment: AI for feedback or scoring, learning analytics and immersive technologies. Publicly available institutional documents, policies, regulations, strategic plans and assessment-related webpages were examined to identify the extent to which these technologies were formally documented and embedded within institutional assessment systems.

The findings reveal a differentiated pattern of institutionalisation. Learning analytics emerged as the most visible and established area, with an average score of 0.8 on a three-point scale ranging from absence (0) to explicit institutional evidence (2). Several universities documented the use of dashboards, performance indicators, monitoring systems and reporting tools designed to support student progression and institutional decision-making. This result is consistent with the evolution of learning analytics as a field focused on the collection, analysis and use of learner data to improve educational processes (Siemens, 2013).

Artificial Intelligence showed considerably lower levels of formalisation (M = 0.3). Only a small number of institutions explicitly documented AI-supported feedback systems, adaptive learning environments or intelligent tutoring solutions. Although AI is increasingly recognised as a promising technology for automated grading, personalised feedback and assessment support, institutional adoption appears to remain cautious (Swiecki et al., 2022). This may be explained by ongoing concerns regarding transparency, bias, accountability and ethical governance (Holmes et al., 2023).

A similar pattern emerged for immersive technologies (M = 0.3). Evidence of virtual reality, simulations or augmented reality within assessment practices was limited and concentrated in a small number of institutions. Despite their potential to support authentic and experiential assessment, immersive technologies often require substantial investments in infrastructure, pedagogical redesign and staff training (Stracke et al., 2025).

Overall, the findings suggest that technological innovation in assessment is shaped not only by technological availability but also by institutional capacity to formalise and govern innovation. Learning analytics appears more easily aligned with existing organisational functions such as monitoring and quality assurance, whereas AI and immersive technologies still occupy a more experimental position within online higher education. Understanding these dynamics may contribute to the development of more coherent and sustainable digital assessment ecosystems.

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Digital Technologies in Early Childhood Education Services: Pedagogical Reflections on the Inclusion of Deaf Children

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The presence of digital technologies in early childhood education and care services has progressively moved beyond both technodeterministic interpretations and radically resistant positions, moving instead toward a more mature approach capable of reconnecting the use of digital tools to educational intentionality, the specificity of contexts, and the central role of the adult as mediator. This approach becomes particularly relevant when considered from an inclusive perspective, with specific reference to deaf children and to the communicative, relational, and linguistic characteristics that shape their experiences within educational settings. Indeed, deafness calls for the design of accessible and participatory learning environments, in which the plurality of communication channels, the attention to the visual dimension and the intentional organization of interactions can support the active involvement of all children. In this sense, digital technologies may represent a significant pedagogical resource, not merely as compensatory tools, but as devices capable of enhancing the interpretation of routines, supporting joint attention, broadening access to experience, and promoting inclusive processes. Starting from these premises, this contribution aims to offer a theoretical reflection on the use of digital technologies in early childhood education settings, highlighting their potential in relation to deafness and emphasizing the need for rigorous professional mediation and the intentional design of spaces, times and interactions.

Designing digital educational spaces for early childhood education services, especially in the presence of children with hearing disabilities, requires a profound pedagogical reflection. It is essential to move beyond the idea that technology can constitute an automatic solution to the challenges of inclusion, just as it is necessary to avoid excluding, a priori, any form of digital device from early childhood contexts. The nursery should not be understood simply as a place to be digitalised, but rather as a complex educational environment. Within it, spaces, times, materials, routines, relationships and mediations must be carefully organised in order to ensure the participation of all children (Bondioli & Savio, 2018; Restiglian, 2012; Zappalà, 2023). When deaf or hard-of-hearing children are present, educational design becomes even more crucial. Indeed, much of the information that is usually conveyed through voice, sounds or implicit communication must be made visible, predictable and accessible through different codes (Maragna, Roccaforte, & Tomasuolo, 2013; Aiello, 2023). Hearing disability is not merely a matter of sensory loss; rather, it must be understood within the relationship between the child's functioning and the quality of the educational environment. It is therefore important to consider the communicative, linguistic, relational and environmental dimensions that influence the child's ability to understand, choose, play, interact and feel part of a group (Gaspari, 2019; AA.VV., 2020; World Health Organization, 2021).

From this perspective, digital technologies may be regarded as a possible form of mediation, but only if they remain at the service of the quality of pedagogical design. This does not mean replacing the body, relationships, manipulation, symbolic play and concrete experience with a screen; rather, it means understanding how certain tools, when used in a measured, intentional and shared way, can make routines clearer, narratives more accessible, sequences more visible and group experiences more engaging (NAEYC & Fred Rogers Center, 2012; Di Bari & Mariani, 2018; Dini & Ferlino, 2016). A hybrid educational environment is therefore not a space dominated by digital technologies, but a context in which analogue materials and digital tools interact in a balanced way. Photographs, enlarged images, short visual sequences, projections, light tables, interactive surfaces and multimodal supports can help create clearer and more accessible contexts, provided that they are always

accompanied by the guidance of the educator and connected to real, bodily and relational experiences (Torres et al., 2021; Chu, 2024; Bourbour, 2023).
In the reading corner, for example, digital technologies can enrich the experience of picturebooks by offering enlarged images, short projections or visual narrative sequences, without replacing the book, the voice, gestures, facial expressions and the presence of the educator. For a child with hearing disability, the possibility of viewing a projected scene, visually reconstructing the order of events or associating images, narrative objects and gestures can make it easier to understand meaning and actively participate in the group. In the symbolic play corner, photographs and short visual supports can help children recognise roles, objects and actions, making the implicit rules of pretend play clearer. In the manipulation area, digital technologies can amplify details and accompany exploration through images, lights or projections, while the central experience remains that of the body touching, experimenting, transforming and constructing. Moreover, in pedagogical ateliers, the integration of analogue materials, light, shadows, projected images, interactive surfaces and concrete objects can create multisensory environments in which the child participates through gestures, gaze, movement and interactions with peers. In this sense, the atelier can become a space for research and expression, where digital technologies do not generate an artificial experience but expand opportunities to explore, represent and communicate (Weyland & Galletti, 2018; Bonarini & Jansens, 2020; Cranmer, 2021).
The routines corner can also benefit from visual and digital supports. Images, photographs and sequences can help children understand the organisation of the day, anticipate the transition from one activity to another and recognise recurring moments in nursery life. This is particularly useful for deaf or hard-of-hearing children, who may not fully grasp rapid verbal instructions or sound signals present in the environment. However, it is essential that these tools be simple, coherent and stable, in order to avoid visual overload that could create confusion rather than facilitate access (Bulgarelli, 2018; Chiappetta Cajola & Rizzo, 2014; Bianquin & Bulgarelli, 2022).
In services for children aged 0 to 3, prolonged and passive screen use is not aligned with the developmental needs of young children, who need movement, active play, manipulation of objects, adequate sleep and direct interaction with others (World Health Organization, 2019). Nevertheless, brief, shared and targeted use can enrich certain educational experiences, such as choosing between two images, following a sequence, participating in a visual narrative or recognising objects and peers through photographs related to nursery life (Neumann, 2016; Oliemat, Ihmeideh, & Alkhawaldeh, 2018). Digital design must therefore follow clearly defined criteria: intentionality, moderation, accessibility, concreteness, sharing and evaluation. No tool is intrinsically inclusive; it becomes inclusive only when the educator integrates it within a context that promotes joint attention, participation in small groups, peer interaction and the understanding of meanings. In summary, designing digital spaces for children with hearing disabilities means creating environments that are communicatively accessible, visually clear, relationally rich and pedagogically intentional. Digital technologies can play a limited but significant role, provided that they remain at the service of the educational experience, alongside materials, movement, play, routines and relationships.

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Hybrid and Emotionally Aware Learning Environments: an Experimental Study on Intelligent Educational Architectures

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The study analyses the effectiveness of hybrid and emotionally aware learning environments, understood as educational ecosystems capable of integrating digital technologies, physiological and environmental data, socio-emotional practices and teacher mediation. The theoretical premise is that learning is not an exclusively cognitive process, but a multidimensional experience in which emotions, the body, relationships and the environment interact with attention, motivation and self-regulation. The perspective adopted is simultaneously pedagogical, relational and ecological. The main objective is to assess the impact of a sensor-equipped hybrid learning environment on pupils' psychological and physical wellbeing, engagement, emotional regulation and the socio-relational climate of the classroom. A randomised controlled experimental design with pre-test/post-test measures and a mixed-methods approach was adopted. The sample comprised 120 pupils aged between 11 and 13, divided into an experimental group and a control group, each with 60 participants. Allocation was carried out via simple randomisation, with baseline equivalence checked for the main variables. The control group followed the same curricular activities, but without the innovative components introduced in the experimental group. The intervention lasted eight weeks and was structured into baseline, implementation and evaluation phases. During the first week, baseline data were collected and the pupils were familiarised with the wearable devices. From the second to the seventh week, the intervention incorporated environmental monitoring, physiological monitoring, a teacher dashboard and social-emotional teaching practices. The sensors measured light, noise, air quality, heart rate and heart rate variability. The information, used in aggregated and non-diagnostic form, was fed back to the teacher to support adjustments to teaching practice without replacing the teacher's professional judgement. The environment was also enhanced with adaptive lighting, controlled soundscapes and social-emotional learning routines, including breathing exercises, mindfulness, emotional check-ins, cooperative activities and reflective debriefings. In the eighth week, post-test measurements were repeated and focus groups with pupils and interviews with teachers were conducted. Data collection incorporated quantitative tools, physiological measures and qualitative techniques. Psychological well-being was assessed using the WHO-5 Well-Being Index, engagement using the Student Engagement Scale, difficulties with emotional regulation using the DERS, and classroom climate using the Classroom Environment Scale. The qualitative component included focus groups, semi-structured interviews and systematic observations. The quantitative data were analysed using repeated-measures ANOVA with a mixed-design, whilst the qualitative data underwent thematic analysis and were subsequently triangulated with the quantitative evidence. The results show significant improvements across all the main dimensions considered in the experimental group. Psychological well-being increased from 52.3 to 68.7 points, representing a change of +16.4 and a medium-to-high effect size ($d = 0.72$), whilst in the control group the change was minimal and not significant. Difficulties with emotional regulation decreased significantly, with the DERS score falling from 88.5 to 72.1, highlighting progress particularly in impulse control and the use of regulatory strategies. Academic engagement also increased across its cognitive, emotional and behavioural components, with the most marked increase observed in the emotional dimension. The classroom atmosphere improved in terms of cohesion, support and participation, whilst the control group showed no significant changes. Physiological measures confirm these findings: in the experimental group, a reduction in mean heart rate and a significant increase in HRV were observed, consistent with improved autonomic regulation and reduced stress-related activation. The qualitative data also align with the quantitative findings. Pupils describe the environment as calmer, less stressful and more conducive to concentration; they report a greater ability to recognise and manage emotional

states and demonstrate more active engagement. Peer relationships also improve, with greater collaboration and less conflict. Teachers highlight that the dashboard and environmental feedback have facilitated a more attentive understanding of classroom dynamics. Overall, the triangulation of the data suggests that the effectiveness of the intervention stems not from a single technology, but from the integration of the physical environment, data, socio-emotional practices and pedagogical mediation. Technology therefore serves to support teachers' professional practice rather than to replace them. The study has a number of limitations: its short duration, the involvement of a single school context, a possible novelty effect, and the need for caution when interpreting physiological data. The authors suggest longitudinal studies, larger samples and future integration with artificial intelligence, accompanied by ethical considerations, transparency and data protection. The results thus support the design of learning environments that are more adaptive, inclusive and well-being-oriented.

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Risky Play in Learning Environments:
A Comparative Study of Educators' and Families' Perceptions

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This contribution investigates representations of risk and risky play in early childhood educational and family contexts. Drawing on literature that distinguishes risk from hazard and interprets risky play as a significant dimension of development and learning (Sandseter, 2007, 2009; Brussoni et al., 2015), the study explores how early childhood educators, preschool teachers, and families define the boundaries between protection, autonomy, and growth.

The research is part of a broader mixed-methods project on risk perception in the 0-6 age group. This contribution focuses on the qualitative component, based on open-ended responses collected through two parallel questionnaires administered in the Tuscany Region to early childhood educators and preschool teachers, and to parents and family members of children aged 0-6. The sample consists of 542 education professionals and 1,585 family members. Both questionnaires included a socio-demographic section and two main areas: the first presented free-play scenarios related to four macro-areas (bodily, sensorimotor, structured, and vicarious play), while the second focused on indoor and outdoor play contexts. For each scenario, participants separately assessed risk, understood as an opportunity for learning and development, and hazard, understood as the possibility of harm. Open-ended spaces allowed participants to add comments and personal reflections. The qualitative corpus examined in this contribution consists specifically of the textual responses relating to indoor and outdoor contexts. These responses were analysed through Reflexive Thematic Analysis (Braun & Clarke, 2006).

The analysis identified five main themes. The first interprets risk as a necessary condition for development: education professionals describe challenging experiences as opportunities to support autonomy, motor and social skills, self-regulation, and confidence in one's abilities. Families also recognise the value of direct experience, although they more often place it within a framework of care, supervision, and protection. The second theme concerns the adult as a regulator of risk: in professional narratives, adult presence is associated with observation, mediation, and the preparation of meaningful environments; in family narratives, it is mainly connected to vigilance and the prevention of harm. The third theme highlights environments as mediators of experience: outdoor spaces, gardens, courtyards, and natural or semi-natural settings offer children diverse opportunities for movement, exploration, and gradual risk management. The fourth theme distinguishes physical from social risk: while education professionals mainly refer to spaces, materials, falls, and bodily safety, families express concerns related to public places, strangers, and the unpredictability of social interactions. The fifth theme reveals different cultures of risk: a more pedagogical and development-oriented culture among education professionals, and a more protective and care-oriented culture among families.

These differences do not outline an opposition between safety and development, but rather different educational rationalities through which adults negotiate the meaning of risk in children's everyday lives. Starting from these results, the contribution proposes the concept of an educational community of risk, understood as a relational and pedagogical space in which risk management is not reduced to an individual or technical responsibility, but becomes a shared process based on dialogue, negotiation, and co-responsibility among educational services, schools, and families. From this perspective, risky play is not merely a play practice, but an interpretive lens through which a community defines childhood, children's agency, care, and autonomy.

The findings suggest several pedagogical implications. Initial and continuing education for early childhood educators and preschool teachers should include reflection on risk-benefit assessment and on the educational value of uncertainty (Ball, Gill, & Spiegal, 2019). Educational environments should be designed and monitored not only to prevent harm, but also to offer rich and developmentally appropriate challenges. Finally, partnerships between families and professionals should be strengthened in order to construct shared meanings around acceptable risk, children's autonomy, and adult responsibility. Promoting risky play therefore requires a community-based competence: the shared capacity to regulate the relationship between protection, exploration, and development.

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Cultivating humanity in the age of AI: supervision as a space for emotional literacy

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In today's world, the integration of AI produces simulated affectivity that can recognize emotional patterns yet lacks the depth of human value judgments. According to Nussbaum's cognitive-evaluative theory (Salerno, 2021), emotions are rooted in vulnerability and individual beliefs—elements that AI cannot replace. Education professionals, working in highly emotionally charged contexts, are constantly under pressure from this environment to the point of experiencing forms of chronic stress, such as burnout. In this scenario, pedagogical supervision emerges as a fundamental tool for supporting well-being and transforming challenges into transformative learning (MLPS, 2021; 2023). The objectives of this study are to analyze the impact of supervision on social-emotional competencies and to test specific programs aimed at in-home educators working in isolation. Pedagogical supervision is conceived as a reflective professional space for connecting theory and practice (Oggionni, 2013; Olivieri, 2024). It fulfills three main functions: administrative (quality standards), educational (skill development), and supportive (management of emotional experiences). Supervision acts as a protective factor, promoting the emotional literacy necessary to navigate the uncertainty of relationships and to foster workplace well-being, understood here according to the Job Demands–Resources Model (JDR) (Bakker & Demerouti, 2007)—that is, as a balance between high emotional demands and personal/organizational resources.
Below is a summary of the project's stages, some of the results achieved, and their implications.
This work integrates two complementary approaches:
- Quantitative study: a cross-sectional correlational design involving 320 education professionals (89% women, mean age 41.3 years). Validated instruments were used: the Warwick–Edinburgh Mental Well-Being Scale (well-being), the Utrecht Work Engagement Scale (engagement), the HSE Indicator Tool (organizational context), and the EI (PcSc) questionnaire for social-emotional competencies. The study aims to analyze the prevalence and impact of pedagogical supervision on well-being, social-emotional competencies, and perceptions of the organizational context.
- Supervision program: a pilot study of a supervision model was launched with a team of in-home educators. The program adopts the Gestalt "contact cycle" (pre-contact, contact, full contact, post-contact), using symbolic mediators and expressive tools to foster emotional awareness.
The survey highlights that the mere presence of supervision (experienced by 58% of the sample) does not guarantee higher levels of well-being. It is the perceived quality (satisfaction) that makes the difference. The tested mediation model demonstrates that satisfaction with supervision predicts emotional self-regulation ($a = 0.246$), which in turn positively influences work engagement ($b = 0.379$). The indirect effect (0.0934) confirms that social-emotional competencies are the channel through which supervision produces well-being.
These findings confirm that the qualitative dimension of the relationship is an irreplaceable element of professional support. The mere availability of a technical solution, an answer, or an explanation—even if correct—does not appear sufficient to ensure well-being, as it lacks the relational responsibility and intentionality that characterize human bonds—dimensions that go beyond the mere delivery of content or the simulation of affection.
The pilot program reveals critical needs related to professional isolation, heavy workloads, and a lack of time for case management, confirming that supervision is an indispensable safeguard—not an optional add-on, but a structural requirement for quality. In an era dominated by AI-generated emotional simulation, supervision restores a human presence. As educators working in isolation move through the stages of the contact cycle, the transition to reflective "full contact" allows them to process heavy workloads and address the structural lack of time for case management. The fact that

emotional self-regulation acts as a mediator suggests that the intervention not only affects immediate well-being but also reinforces the personal resources necessary to manage relational complexity. In contrast to AI simulation, supervision supports intentionality and human connection—elements that are irreplaceable in education. The regularity of meetings also emerges as a crucial moderator, as the link between group work and work engagement is significant only in the presence of consistent supervision.

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Emotionally Aware Multisensory Environments: The Snoezelen Room as a Hybrid Approach for Supporting Well-Being in Adults with Autism Spectrum Disorder

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Promoting quality of life (QoL) is a primary objective of services for individuals with Autism Spectrum Disorder (ASD). Beyond reducing challenging behaviours, effective interventions should foster emotional well-being, self-determination and overall life satisfaction. SR and multisensory environments have gained increasing attention due to their potential to provide structured sensory experiences, reduce stress, and support self-regulation (Leonardi et al., 2025).
This contribution presents preliminary findings from an ongoing intervention study conducted in a Snoezelen Room (SR) with adults diagnosed with ASD. The study aims to explore possible changes in behavioural functioning and perceived quality of life (Schalock and Verdugo, 2006) following participation in a structured multisensory programme.

Method

Five adults with ASD participated in the intervention. One participant was diagnosed with ASD Level 2 and four participants with ASD Level 1. Assessments were conducted before the intervention (T0) and after completion of the planned sessions (T2).
For the participant with ASD Level 2, behavioural outcomes were assessed using the Aberrant Behavior Checklist (ABC), while QoL was measured through the proxy-report version of the Personal Outcomes Scale (POS). Participants with ASD Level 1 completed the self-report version of the POS.
The intervention consisted of structured sessions in a SR designed to provide controlled multisensory stimulation, sensory exploration opportunities, relaxation, and emotional regulation support. The participant with ASD Level 2 attended 20 SR sessions, whereas participants with ASD Level 1 attended 10 sessions each. All sessions were conducted by professionals specifically trained in the use of SR, ensuring consistency in the implementation of the multisensory programme and adherence to person-centred intervention principles. As data collection is still ongoing, the findings reported here should be considered preliminary.

Results

Behavioural Outcomes

For the participant with ASD Level 2, ABC scores showed improvements across several behavioural domains. Hyperactivity decreased from 10 to 6, inappropriate language from 7 to 5, and stereotypic behaviours from 1 to 0. Irritability remained stable, while lethargy showed a slight reduction from 21 to 20.
These results suggest a positive effect of the SR intervention on behavioural regulation, particularly regarding motor activation and repetitive behaviours.

Quality of Life Outcomes

QoL outcomes were more heterogeneous.

For the participant with ASD Level 2, social inclusion showed a slight increase, while interpersonal relationships and physical and material well-being remained stable.
Among participants with ASD Level 1, changes in self-reported QoL were modest:
Participant 2 showed a small increase in total QoL, with improvements in physical and material well-being but a decrease in emotional well-being.

Participant 3 demonstrated a slight increase, accompanied by improvements in emotional and physical well-being.
Participant 4 showed the largest positive change, with improvements across all domains.
Participant 5 reported identical scores at both assessment points.
Overall, three of the four self-report measures indicated slight improvements in total QoL, while one participant reported no change.

Discussion

Preliminary findings suggest that SR-based interventions may contribute to improved behavioural regulation, particularly through reductions in hyperactivity and stereotyped behaviours. These outcomes are consistent with previous research highlighting the potential of multisensory environments to promote relaxation, reduce sensory overload, and support self-regulation in individuals with ASD (eg: Novakovicet al., 2019)
The QoL findings appear more nuanced. Although most participants reported stable or slightly improved levels of well-being, changes were generally modest. This pattern reflects the multidimensional nature of QoL, which is influenced by a range of personal, relational, and environmental factors extending beyond the intervention itself.
Particularly noteworthy is the discrepancy between behavioural improvements and QoL outcomes. Positive changes in observable behaviour may not immediately translate into substantial improvements in perceived QoL, especially within relatively short intervention periods.

Conclusions

Although based on a very small sample and collected within an ongoing study, these preliminary findings suggest that SR interventions may support behavioural regulation in adults with ASD and contribute to maintaining or modestly enhancing selected dimensions of QoL.
The variability observed across participants indicates that responses to multisensory interventions are highly individualized and may be influenced by sensory profiles, support needs, and contextual factors. As the study is still in progress, additional data will help clarify the consistency and durability of these effects.

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Multisensory Synergies and Digital "Active Breaks": Enhancing Executive Functions and Emotional Well-being

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The growing diversity of school contexts requires teaching approaches that can integrate learning, participation and well-being without introducing unsustainable procedures. Embodied Cognition provides a significant theoretical framework from this perspective, as it views cognition as a situated process that emerges from the interaction between the body, action, and the environment (Wilson, 2002). According to this framework, movement is not merely an incidental element of the educational experience; it can also contribute to the regulation of attentional processes and the creation of conditions that support learning. One practical application of this approach is 'Active Breaks', which involve short physical activities incorporated into teaching to interrupt prolonged periods of inactivity and re-engage attention. Available evidence suggests that physical activity in the classroom has beneficial effects on behaviour, engagement and certain cognitive outcomes, despite the variety of protocols adopted (Watson et al., 2017; Daly-Smith et al., 2020; Masini et al., 2020). Of particular significance is the link with executive functions, such as inhibitory control, working memory and cognitive flexibility, which play a role in the intentional regulation of behaviour and learning (Diamond, 2013). Against this background, this paper proposes an exploratory protocol for the systematic introduction of digital 'Active Breaks' in primary and lower secondary schools. The study aims to conduct a preliminary assessment of the feasibility of implementing the model in schools and to identify changes in attention, participation, emotional self-regulation, and perceived well-being. Students do not use the AI and it does not collect personal data; it is used solely to support the teacher's project work, with the teacher remaining responsible for assessing proposals and making educational decisions. The design is a single-group pre-test–intervention–post-test pilot study. The protocol involves a class of around 10–15 pupils and runs for four weeks without altering the usual lesson organisation. Two active breaks are scheduled each day, each lasting approximately five minutes. They comprise rhythmic and musical exercises, coordination games, cross-body movements, motor sequences to be memorised, balance activities, 'stop and go' games, and short breathing exercises. The assessment incorporates both quantitative and qualitative data. Before and after the intervention, teachers complete the teacher version of the Strengths and Difficulties Questionnaire, paying particular attention to the Hyperactivity/Inattention and Prosocial Behaviour subscales. A specially designed grid is used to assess attention, participation and engagement. Pupils also complete a short, anonymous Likert-scale questionnaire regarding satisfaction, perceived well-being, engagement and attention. A weekly log documents the progress of the intervention, critical issues, adjustments made, and perceptions of the usefulness of the AI support. At the end of each week, the teacher summarises the observations gathered and notes any lapses in attention, difficulties with activities or varying levels of engagement. This information, which does not contain any personal data, enables the AI to suggest adjustments to the duration, complexity and type of activities. These suggestions are not prescriptive but are subject to the teacher's professional judgement. Personalisation therefore remains part of the teacher's reflective process and is not delegated to technology. The quantitative data will be analysed using descriptive statistics and by comparing pre- and post-intervention measurements; the logbook will be subjected to thematic analysis. Given the exploratory nature of the study and the absence of a control group, the results cannot be interpreted in causal terms, but may offer preliminary insights for subsequent trials involving larger samples and controlled designs. The protocol aims to assess the feasibility of a model in which movement, cognitive processes, the emotional dimension and digital technologies combine to create a flexible and inclusive learning environment. The value of Active Breaks lies in their intentional design and in

the possibility of tailoring them to the characteristics of the class group. Within this framework, AI can support pedagogical reflection without replacing the teacher's observation, expertise and educational responsibility.

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From Algorithmic Responsiveness to Educational Responsibility: The Possibilities and Limitations of Artificial Empathy in Addressing University Dropout

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University dropout is a multidimensional phenomenon associated with academic performance, psychological well-being, motivation, social integration, and a sense of belonging. Academic persistence also depends on whether students perceive the university as a community capable of recognising their difficulties and providing meaningful support. Educational relationships therefore constitute a structural component of student retention (Tinto, 2017). Artificial intelligence-based chatbots create new opportunities for academic guidance, student support, personalised feedback, and the early identification of disengagement. Their continuous availability and capacity to provide context-sensitive responses may lower barriers to help-seeking (Okonkwo & Ade-Ibijola, 2021). Yet when these systems are deployed in situations marked by failure, loneliness, or distress, they cannot be assessed solely in terms of usability and effectiveness. It is also necessary to examine the relationships they simulate and determine the extent to which educational care can be mediated by AI without weakening the human bonds on which it depends.

Relational pedagogy and educational care

The theoretical framework brings together research on academic persistence, relational pedagogy, and the ethics of care in higher education. Relational pedagogy identifies trust, responsiveness, and recognition as important conditions for learning, well-being, and participation (Su & Wood, 2023; Plantin Ewe & Fjelkner Pihl, 2024). Drawing on Noddings (2013), care is understood not merely as service provision, but as a personal, institutional, and political practice that raises questions about how universities recognise or neglect students' vulnerability (Baker & Burke, 2023). Biesta's (2022) world-centred perspective likewise resists reducing education to performance and measurable outcomes, reframing it as an encounter with the world and with otherness through which the subject may assume a responsible position.

Artificial empathy and algorithmic care

Conversational systems complicate this framework by introducing forms of artificial empathy. They can identify emotional cues in language, modulate their tone, offer encouragement, and simulate active listening. This capacity is not equivalent to human empathic experience: an AI system does not feel emotions, possess lived experience, or bear moral responsibility for its responses (Montemayor et al., 2022). It is therefore necessary to distinguish between lived empathy, computationally generated empathic communication, and empathy as perceived by users (Paiva et al., 2017). A chatbot may not be empathetic in a phenomenological sense, yet may still produce a response experienced as reassuring. The pedagogical issue concerns the conditions under which such simulation may provide support, generate ambiguity, or cause harm. The concept of algorithmic care captures this tension. On the one hand, AI can enhance accessibility, provide initial guidance, detect signs of disengagement, and facilitate referral to appropriate human professionals. On the other hand, it may create an illusion of reciprocity, standardise vulnerability, intensify profiling and surveillance, or replace relational support with automated service provision. A human-centred perspective requires AI to enhance people's autonomy, dignity, and capacity for action (Floridi et al., 2018). Educational technologies are not neutral: they embody particular conceptions of learning, institutional priorities, and modes of computationally profiling students (Selwyn, 2019; Williamson, 2017).

Systematic review protocol

This paper presents a protocol for a systematic review of empirical studies published between January 2022 and June 2026 on the use of AI chatbots to support university students experiencing vulnerability or at risk of dropout. The review will map and synthesise the available evidence, examine how artificial empathy and algorithmic care are conceptualised and operationalised, document outcomes relating to engagement, well-being, perceived support, and academic persistence, and identify the main ethical, pedagogical, and relational risks. Following the PRISMA 2020 guidelines (Page et al., 2021), searches will be conducted in Scopus, Web of Science, ERIC, PsycINFO, PubMed, and IEEE Xplore. The review will include peer-reviewed empirical studies using quantitative, qualitative, or mixed-methods designs, conducted in higher education settings, and focused on conversational agents or generative AI chatbots. Data extraction will address research design, participants, context, system functions, outcomes, perceptions, limitations, and ethical issues. Methodological quality will be assessed using the Mixed Methods Appraisal Tool (Hong et al., 2018), while heterogeneity will be addressed through a thematic narrative synthesis.

Analytical framework and expected contribution

The analysis will be structured around four domains: educational effectiveness, perceived relational quality, ethical and pedagogical risks, and the preservation of human centrality. It will examine the mechanisms that may connect these domains to dropout prevention, including access to support, timely guidance, institutional responsiveness, engagement, and belonging. Inappropriate responses, failures to refer or escalate cases to professionals, algorithmic opacity, bias, privacy breaches, emotional dependency, and overreliance on the system will also be considered. The review aims to develop a pedagogically grounded framework for evaluating conversational AI beyond the paradigm of technological efficiency. The educational value of chatbots lies not in replacing human empathy, but in transparency regarding the simulated nature of their responses, responsible design, and integration into institutional networks in which responsibility for decision-making and care remains clearly assigned to human actors. Artificial empathy can support students only when it extends, enables, and activates human relationships, without conflating algorithmic responsiveness with educational responsibility.

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Mediating heritage in distributed educational environments.
A framework for life soft skills assessment in n.o.t.e. project

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Co-design workshops can trigger processes of physical and social regeneration through the shared care of green spaces and derelict public areas (Petrella, 2022). In this context, schools also take on the role of promoting local educational partnerships. Collaborative networks between schools, local authorities, universities, associations and citizens enable the development of innovative forms of participatory governance, capable of addressing educational, social and urban issues in an integrated manner. Through community pacts and collaboration protocols, the school becomes a 'collaboratory' of active citizenship, where practices of shared administration of common goods and new forms of democratic participation are tested. School initiatives can also have a tangible impact on urban planning tools. The participatory processes promoted by schools generate situated knowledge and 'transferable knowledge' that complement the technical work of planners and ensure urban projects are more closely aligned with the real needs of communities. In some cases, educational initiatives serve as genuine preliminary experiments capable of anticipating broader structural transformations (Marini, 2024).

In this context, a particularly significant example of participatory pedagogy applied to the transformation of educational spaces is the N.O.T.E. project – Nuovi Orizzonti Territoriali Ercolano (Raffone & Gemma, 2025). Within the project, the workshop programme dedicated to participatory architecture, 'Imagining and transforming shared spaces', was designed with the aim of changing the way children perceive, experience and use school environments, by directly involving them in the processes of observing, designing and transforming shared spaces. Underpinning the experience is the pedagogical premise that the school environment is not merely a neutral container for educational activities, but acts as a genuine third educator (Malaguzzi, 1995), capable of influencing relationships, behaviours, social dynamics and learning styles. From this perspective, school environments become an integral part of the educational process and can be reinterpreted through practices of active participation and shared design. The first phase of the workshop involved a process of reappropriation and critical analysis of school spaces.

From rubrics to the creation of hybrid learning spaces

In recent years, inclusion has become one of the most recurrent terms in the European educational lexicon. It appears in institutional documents, programmes for educational innovation, territorial policies, and strategies aimed at social cohesion. It is difficult to find an educational project that does not refer, in some form, to the need to promote inclusive processes. Yet, precisely as the concept seems to have gained a central position in pedagogical debate, a question emerges that is rarely addressed in a systematic way: how can inclusion be recognised when it occurs? (Sala et al., 2020). Far less frequent are attempts to identify the elements through which these principles are concretely manifested in educational practices. The risk is that inclusion may end up taking the shape of an evocative category: necessary at the theoretical level, but difficult to describe at the empirical level. From this perspective, the present contribution proposes a shift in focus. Rather than considering inclusion as an abstract property of educational environments, it interprets it as the outcome of processes that take shape through observable behaviours. There is no inclusion without listening and the ability to collaborate. There is no inclusion without the capacity to recognise another person's point of view, to participate in a shared activity, or to attribute meaning to cultural diversity. What is

often defined as inclusion is nothing other than the concrete expression of a constellation of competences that operate simultaneously within educational relationships.

Conclusions

The reinterpretation of the N.O.T.E. project proposed in this contribution makes it possible to highlight an additional dimension beyond those generally attributed to educational and community regeneration projects. Traditionally, such experiences are analysed in relation to the participation of the actors involved, the quality of the relationships established, or the effects generated within the local area. The perspective adopted in this study, instead, suggests that they should also be considered as privileged contexts for the observation of competences.

From this point of view, N.O.T.E. is not merely an innovative educational environment: it becomes a pedagogical observatory. The activities of participatory archaeology, heritage narration, and collaborative design provide opportunities in which inclusive competences can emerge through concrete practices. The value of the project therefore lies not only in the outcomes achieved, but also in its capacity to make visible processes that would normally remain implicit.

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Educational and teaching constructs in the practice of judo: smart training with the new technologies

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Body awareness is a key factor in sports that involve highly complex movements, particularly combat sports such as judo, where technical actions are performed in con-tinuous, unpredictable and physically close interaction with an opponent. In such con-texts, postural control, fine perception of balance, regulation of muscle tone and the ability to modulate strength and intensity are not only prerequisites for effective per-formance, but also have a decisive value in terms of safety, self-regulation and quality of the learning experience (Susanto et al., 2024). Judo, more than other sports, requires practitioners to develop a bodily awareness that allows them to "feel" their own body and that of their opponent in real time, continuously adapting their movements to the perceptual information emerging from contact and interaction. In literature, body awareness is generally defined as the ability to perceive, inter-pret and integrate sensations from the body, including proprioceptive, interoceptive and exteroceptive components (Mehling et al., 2012). It includes the recognition of signals related to posture, muscle tension, breathing and fatigue, as well as the ability to use this information to regulate motor behaviour. In sports, this construct has been associated with improved self-regulation skills, greater movement efficiency and a reduced risk of injury, especially in disciplines that require fine control of the body in dynamic and unstable conditions. Judo, based on the principles of seiryoku zen'yō (maximum efficiency with mini-mum energy expenditure) and jita kyōei (mutual prosperity) is a particularly significant context for the development of body awareness. Technical effectiveness in judo does not derive from the application of force in a quantitative sense, but from the ability to perceive and exploit imbalance, timing and direction of movement, both of one's own body and that of one's partner. From this perspective, body awareness is not only a functional skill for performance, but a condition that guides the practitioner towards a more economical, safe and sustainable management of motor action.

Numerous studies have shown that regular practice of physical and martial disci-plines is associated with higher levels of body awareness, mindfulness and emotional and motor self-regulation (Daigo, 2005; Kerr et al., 2006). However, much of the available research has focused on predominantly quantitative approaches based on self-report instruments, which, while offering useful insights into the level of body awareness, tend to neglect the experiential, situated and relational dimensions of the construct. In this regard, recent evidence highlights how judo, when embedded in structured educational settings, can foster not only emotional self-regulation but also the development of posi-tive interpersonal relationships and reflective emotional awareness (Gravino et al., 2025). In particular, little research has been done on how judo practitioners attribute meaning to their bodily sensations during training and interaction, and how these meanings are constructed over time within specific educational and relational contexts.

At the same time, in recent years there has been growing interest in the educational and pedagogical dimensions of sports practice, with particular attention to the role of the training environment and the quality of relationships in supporting deep and inclusive learning processes (Di Palma et al., 2025). In this context, body awareness can be inter-preted not only as an individual skill, but as an educational outcome that emerges from the interaction between practical experience, educational planning and the relational context. An environment perceived as safe, non-judgmental and cooperative can in fact encourage exploration, attention to bodily sensations and a willingness to experiment with new motor solutions, while contexts that are overly performance-oriented can in-

hibit these processes, leading to rigidity, defensive automatisms and inefficient use of force (Latino et al., 2019).

In light of these considerations, it seems necessary to adopt research perspectives capable of integrating quantitative and qualitative data in order to grasp the complexity of the phenomenon and provide a more articulated view of body awareness in the practice of judo. In particular, it is important to investigate not only the level of body awareness in practitioners, but also the ways in which it is experienced, learned and supported within specific teaching settings, as well as its relationship with the percep-tion of inclusiveness in the training context. This study fits into this perspective and aims to explore body awareness in a group of judo practitioners through a convergent mixed-methods design, integrating standardised measures and semi-structured inter-views. The objective is to understand body awareness not only as a correlate of perfor-mance or accumulated experience, but as an educational and instructive construct, in-fluenced by the quality of practice, instructional design, and relational climate. In this sense, judo is considered not only as a sport, but as a privileged training context for the development of perceptual, self-regulatory and relational skills, which are relevant both for performance and for the wellbeing and participation of athletes.

Methodology

Study design and participants

The study adopted a convergent mixed-methods design, combining quantitative and qualitative data collected over the same time period. The sample consisted of 35 participants enrolled in a judo course at an amateur sports club (21 men and 14 women), aged between 18 and 45 years (M = 27.6; SD = 6.4). The length of practice ranged from 1 to 18 years (M = 6.9; SD = 4.2).

Inclusion criteria:

• active enrolment in the judo course for at least 12 months;
• minimum attendance of two training sessions per week;
• absence of acute injuries in the three months prior to the survey;
• absence of current neurological or psychiatric diagnoses.

All participants provided written informed consent.

Tools

Body Awareness Questionnaire (BAQ)

Body awareness was assessed using the Body Awareness Questionnaire (Shields, Mallory & Simon, 1989), a self-report tool consisting of 18 items on a 7-point Likert scale, designed to measure sensitivity to normal, non-pathological bodily sensations. The BAQ is widely used in psychology and sports and has good psychometric properties, with internal reliability coefficients reported in the literature above $\alpha = .80$.

Semi-structured interviews

For the qualitative investigation, individual semi-structured interviews were con-ducted, with an average duration of 30 minutes. The interview guide explored:

perception of the body during training and sparring/competition;
awareness of balance and the center of gravity;
ability to recognize tension and states of fatigue;
the relationship between body awareness and technical learning.

The interviews were transcribed verbatim and analyzed using thematic analysis (Braun & Clarke, 2006).

Teaching activities

During the observation period, which lasted a total of eight weeks, the training program was structured according to an intentional instructional design aimed at inte-grating technical, perceptual, and relational dimensions, with the goal of fostering the development of body awareness within an inclusive context. Each session, with an av-erage duration of 90 minutes, followed a recurring structure consisting of an initial ac-tivation phase, a central phase focused on technical–perceptual work, and a concluding reflection phase, in order to make body awareness a transversal and continuous element of the training experience.

The initial phase was dedicated to low-intensity mindful warm-up exercises, during which participants were asked to focus their attention on specific bodily sensations, such as foot contact with the tatami, postural alignment, and breathing rhythm. This phase served to facilitate attentional orientation toward the body and to prepare practitioners for a more refined listening to internal sensations, reducing motor automatisms and in-itial rigidity.

A first structured area of intervention concerned work on ukemi, initially proposed in an analytical form and subsequently in more dynamic sequences. The exercises in-volved performing falls at controlled speed, with specific instructions related to the perception of contact points with the tatami, body weight distribution, and modulation of muscle tone. Particular attention was paid to the coordination between movement and breathing, inviting practitioners to observe how exhalation facilitated the release of tension during impact. Gradually, variations requiring different postural adaptations were introduced, with the aim of expanding the sensory repertoire and improving the ability to recognize bodily signals related to safety and movement control. Beyond their preventive function with respect to injuries, ukemi were used as a tool for perceptual education, in line with the motor learning literature, which emphasizes the importance of slowing down movement and attentional focus to promote sensory integration and the stabilization of motor patterns (Schmidt & Lee, 2011).

A second area of intervention focused on work on kuzushi and the preparatory phases of technique (tsukuri), through controlled imbalance exercises performed in pairs. In this phase, activities were designed to minimize the performance-oriented goal of throwing, instead emphasizing the exploration of bodily sensations associated with loss and recovery of balance. Participants were invited to attend to the position of their center of gravity, the relationship between base of support and stability, and the mi-cro-postural variations induced by contact with the partner. Instructional cues empha-sized listening to tactile and proprioceptive information coming from the partner's body, fostering an embodied understanding of movement. This type of work is con-sistent with the embodied approach to motor learning, according to which technical knowledge emerges from situated bodily experience and interaction with the envi-ronment and with others, rather than from exclusively cognitive instructions (Latino et al., 2023; Shusterman, 2008).

Thematic randori represented a central component of the instructional pathway and was used as a privileged space for integrating body awareness and dynamic interaction. Unlike free randori, intentional constraints were introduced, such as limiting intensity, reducing execution speed, or focusing on specific perceptual aspects (e.g., shoulder po-sition, arm tension, or foot contact with the tatami). In some sessions, randori included brief reflective pauses, during which participants were invited to notice any changes in bodily sensations in relation to the intensity of the exchange. This approach fostered a climate of exploration and cooperation, reducing performance anxiety and allowing practitioners to maintain a higher level of somatic attention. Previous studies have shown that practice contexts that are less competitive and more exploration-oriented promote deeper motor learning and better self-regulation (Kerr et al., 2006).

The concluding phase of each session was dedicated to brief moments of guided reflection, lasting approximately 5–10 minutes. This phase could take the form of verbal sharing in small groups or a moment of silent self-observation, during which partici-pants were invited to mentally revisit the bodily experience they had just undergone. The guiding questions proposed by the instructor aimed to facilitate awareness of rele-vant bodily signals (e.g., sensations of tension, balance, fatigue, or movement fluidity) and to connect these experiences to technical learning. This metacorporeal phase served an integrative function between lived experience and reflective awareness, fostering the verbalization of sensations and their recognition as an integral part of the motor learning process.

Quantitative results

The analysis of the quantitative data provides a comprehensive picture of body awareness among judo practitioners, highlighting overall medium-to-high levels of the construct, moderate variability, and significant differences as a function of experience and training context. The sample (N = 35)

ranged in age from 18 to 45 years (M = 27.6; SD = 6.4) and had between 1 and 18 years of practice experience (M = 6.9; SD = 4.2), thus constituting a heterogeneous group in terms of expertise level.

Body Awareness Questionnaire (BAQ): overall descriptive statistics

Scores on the Body Awareness Questionnaire (BAQ; theoretical range 18–126) indicate a medium-to-high level of body awareness in the sample. The mean total score was M = 89.4 (SD = 11.6), with values ranging from a minimum of 64 to a maximum of 112. The distribution of scores shows a predominant concentration in the mid-to-high range of the scale: the 25th percentile was P25 = 81, the median Md = 90, and the 75th percentile P75 = 98, with an interquartile range of IQR = 17, indicating moderate variability.

Internal consistency of the BAQ in this sample was high (α = .84), confirming the good reliability of the instrument also within the specific context of combat sports.

Item-level analysis: profile of body awareness components

Item-level descriptive analysis reveals a profile consistent with the perceptual–motor demands of judo. The items with the highest mean scores concerned:

- perception of balance and posture (M item = 5.6–5.9),
- modulation of muscle tone (M item = 5.4–5.8),
- recognition of bodily changes related to fatigue (M item = 5.3–5.7).

These items showed limited dispersion (SD item = 0.7–0.9), suggesting a relatively shared competence among practitioners. In contrast, items related to the ability to an-ticipate bodily reactions in novel or unpredictable situations showed lower mean values (M item = 4.6–4.9) and greater variability (SD item = 1.1–1.3), indicating a component of body awareness that is more sensitive to individual differences and accumulated expe-rience.

Body awareness and practice experience

To examine the effect of experience, the sample was divided into two groups based on years of practice: less experienced practitioners ($\leq$ 5 years; n = 16) and more experienced practitioners ($\geq$ 6 years; n = 19). The more experienced group showed significantly higher BAQ scores (M = 94.1; SD = 9.8) compared to the less experienced group (M = 83.8; SD = 10.7), with a mean difference of ΔM = 10.3 points.

Group comparisons also revealed reduced variability among more experienced practitioners, suggesting body awareness that is not only higher but also more stable. The correlation between years of practice and total BAQ score was positive and moder-ate (r = .46; p = .005), indicating that increased experience is associated with a progressive enhancement of bodily listening and monitoring abilities.

Index for Inclusion: perception of the training context

Scores on the Index for Inclusion indicate that the training context was perceived as predominantly inclusive. The overall mean score was M = 3.9 (SD = 0.5) on a 5-point scale, with values ranging from a minimum of 2.8 to a maximum of 4.7. The dimensions with the highest scores concerned:

- sense of belonging to the group (M = 4.2; SD = 0.6),
- mutual support and cooperation (M = 4.1; SD = 0.5),
- reduction of performance judgment and a non-judgmental climate (M = 3.8; SD = 0.6).

Relationship between body awareness and inclusive climate

Analysis of the relationships between variables revealed a significant positive correla-tion between BAQ scores and Index for Inclusion scores (r = .41; p = .012). This result suggests that a training context perceived as more inclusive and supportive is associated with higher levels of body awareness. In particular, the subscale related to psychological safety and the possibility of making mistakes without judgment showed the strongest correlation with the BAQ (r = .44; p = .008).

Overall, the quantitative results indicate:

(a) medium-to-high levels of body awareness among judo practitioners;

(b) a clear positive gradient as a function of practice experience, with higher and more stable scores among more experienced practitioners;

(c) a significant relationship between body awareness and the perceived inclusivity of the training context.

These findings support the interpretation of body awareness as a dynamic and multifactorial competence emerging from the interaction between prolonged practice, the quality of the instructional setting, and the relational climate.

Qualitative results

The thematic analysis of the semi-structured interviews made it possible to explore how practitioners interpret and attribute meaning to their bodily sensations during training and interaction, revealing a framework consistent with the idea of body awareness as a progressive, situated, and relational competence. First, a recurring theme was identified as "feeling before acting", referring to the transition from a more "mental" and rigidly voluntary motor control to a more perceptual and fluid regulation. Several participants described body awareness as a form of immediate "reading" of internal signals (tension, support, weight direction) that anticipates technical action: "At the beginning I only thought about doing the movement correctly; now I notice if I'm off balance even before trying the technique" (P7). Among more experienced practitioners, this theme was accompanied by a reduction in the use of unnecessary force and greater economy of movement, often expressed as the ability to "let go": "When I stiffen up, I feel like I lose everything—timing, balance… if I manage to relax my shoulders, the technique works better" (P12). Among less experienced practitioners, body awareness more frequently emerged as a gradual discovery of bodily signals that had previously gone "unnoticed": "I'm re-alizing how much tension I keep in my arms even when it's not needed" (P4).

A second theme, strongly connected to the specificity of judo, was termed "balance as a dialogue with the other." Participants described balance not as a stable individual condition, but as a dynamic process constructed through contact and exchange: "It's not just about being balanced on your own; when you touch the other person, you immediately un-derstand whether you're 'up' or starting to give way" (P19). In this perspective, contact is interpreted as sensory information: grip, pressure, direction of force, and mi-cro-variations in support become signals useful for reading both one's own body and that of the partner. Some interviewees emphasized that during kuzushi and tsukuri exercises, body awareness increases precisely because the task is not "to win" but "to feel": "When we do slow imbalance exercises, I notice things that I don't perceive in normal randori… like where I'm really loading my weight" (P9). This theme is particularly relevant because it provides an embodied interpretative key to the quantitative results: for many partici-pants, body awareness coincides with the ability to perceive and modulate the center of mass in relation to the other.

A third theme concerned the self-regulatory dimension and was summarized as "recognizing limits and modulating intensity." Interviewees reported that listening to the body primarily means intercepting signals of fatigue and overload (shortness of breath, muscle burning, cervical or lumbar stiffness) and translating them into operational de-cisions (reducing intensity, changing the task, recovering). This theme frequently emerged in relation to ukemi activities and final reflection moments, which were per-ceived as facilitators of "awareness": "Before, I pushed until it hurt; now I realize earlier when I'm entering a 'risky' zone" (P21). Some participants associated this ability with increased technical effectiveness: "If I hold my breath, I stiffen up and waste energy; when I breathe better, I feel more in control" (P3). In particular, breathing was described both as an "indicator" and a "tool": an indicator of stress and a means for regulating muscle tone.

A fourth theme, closely connected to the evaluation of the context (Index for In-clusion), was defined as "the body learning in a safe and inclusive environment." Many par-ticipants linked the possibility of listening to the body and experimenting without fear to the perception of a non-judgmental, cooperative climate that respects differences in skill level: "If you know you can make mistakes, you really try. If you feel judged, you close yourself off and just use force" (P14). The use of thematic and constrained randori was frequently in-terpreted as a strategy that reduces performance pressure and allows attention to remain focused on sensations: "In slow randori I can stay present: I feel my feet, I feel my hips. When it's too competitive, I go on autopilot" (P6). This point is particularly

relevant because it highlights a common trajectory: perceived inclusivity is not described merely as "social well-being," but as a condition that makes perceptual learning and body awareness more possible.

Finally, across themes, a qualitative distinction emerged between "intermittent" and "stable" body awareness. Some participants reported that awareness increases during slow and structured exercises but decreases under conditions of high intensity: "When the pace increases, my mind is only focused on not getting caught, and I forget about my body" (P11). Others, more experienced practitioners, described the ability to maintain a kind of "background attention" even during randori: "It's as if a part of me is always listening, even while I'm fighting" (P2). Overall, the qualitative findings confirm that body awareness in judo is not a unitary construct, but rather composed of multiple components (balance, muscle tone, breathing, relationship with the partner, management of pressure) that develop in differentiated ways and are strongly influenced by both experience and the quality of the educational and instructional context.

Discussion

The present study aimed to investigate body awareness among judo practitioners through a mixed-methods approach, integrating standardized measures and analysis of subjective experience. The results confirm that body awareness represents a central di-mension of judo practice and that it emerges as a complex, dynamic competence strongly influenced by both individual experience and the relational and instructional context.

From a quantitative perspective, the medium-to-high levels of body awareness measured through the Body Awareness Questionnaire are consistent with previous studies showing that bodily and martial disciplines foster higher perceptual and self-regulatory skills compared to non-athletic populations (Kerr et al., 2006; Mehling et al., 2012). In particular, the fact that the highest scores concerned items related to pos-tural balance, modulation of muscle tone, and perception of fatigue suggests that judo specifically engages proprioceptive and interoceptive components of body awareness. These findings are in line with recent research highlighting the role of combat sports in the development of postural control and proprioceptive sensitivity, especially under dynamic conditions and continuous physical interaction (Paillard, 2019).

The positive association between years of practice and BAQ scores further supports the interpretation of body awareness as a competence that develops progressively through experience. This finding is consistent with motor learning models describing a shift from predominantly cognitive regulation of movement to more automated and perceptual regulation based on integrated sensory information (Schmidt & Lee, 2011). From this perspective, the reduced intra-group variability observed among more expe-rienced practitioners can be interpreted as an indicator of greater attentional stability and improved integration between perception and action, which are central features of contemporary theories of motor expertise (Ericsson et al., 2018).

The qualitative findings deepen and enrich these results, showing that practitioners experience body awareness not only as a skill functional to performance, but also as a way of relating to their own body and to others. The theme "feeling before acting" clearly reflects embodied and phenomenological approaches to sport, according to which ef-fective action emerges from tacit, embodied knowledge rather than from explicit vol-untary control (Shusterman, 2008; Ravn & Christensen, 2020). Interview narratives in-dicate that, with increasing experience, the body becomes a reliable source of anticipa-tory information, supporting the idea that body awareness functions as a prerequisite for technical effectiveness rather than merely its consequence.

The theme "balance as a dialogue with the other" highlights a relational dimension of body awareness that is often overlooked in traditional quantitative instruments. In judo, perception of one's own body is constantly mediated by contact with the opponent, making body awareness an intersubjective and situated process. This finding is con-sistent with recent studies on motor interaction and interpersonal coordination in combat sports, which emphasize the crucial role of tactile and proprioceptive infor-mation from the other in movement regulation (Seifert et al., 2016; Komar et al., 2019). From this

perspective, body awareness in judo cannot be reduced to an individual con-struct, but should be understood as emerging from interaction.

Particularly relevant is the relationship identified between body awareness and the inclusive climate of the training context. Results from the Index for Inclusion show that an environment perceived as safe, cooperative, and non-judgmental is associated with higher levels of body awareness. This finding is consistent with educational and sport psychology literature highlighting how perceived psychological safety promotes ex-ploration, deep learning, and attentiveness to bodily sensations (Booth & Ainscow, 2011; Deci & Ryan, 2017). Qualitative accounts suggest that reducing performance pressure and allowing mistakes without judgment enables practitioners to remain more con-nected to their bodies, limiting defensive automatisms and excessive use of force.

Moreover, the theme "recognizing limits and modulating intensity" underscores a self-regulatory function of body awareness, in line with recent studies linking intero-ception to stress management, fatigue regulation, and training load management in athletes (Herbert et al., 2019; Berntson & Khalsa, 2021). From this perspective, body awareness appears not only functional to performance, but also relevant for injury prevention and athlete well-being, reinforcing the idea of sport practice as educational and sustainable over time.

Overall, the triangulation of quantitative and qualitative data allows body aware-ness in judo to be interpreted as a multifactorial competence integrating perceptual, relational, emotional, and contextual components. This study contributes to the existing literature by showing how training intentionally oriented toward bodily listening and the construction of inclusive environments can support the development of this com-petence, offering relevant implications for both research and instructional practice in combat sports.

Conclusion

The present study explored body awareness among judo practitioners through a mixed-methods design, integrating standardized measures, assessment of the inclusive climate, and analysis of subjective experience. Overall, the findings allow body aware-ness to be conceptualized as a multifactorial competence that develops over time through practice and is strongly intertwined with the quality of interactions and the instructional context. Judo thus emerges not only as a technical–sport discipline, but also as a privileged environment for perceptual education, in which the body becomes a tool for knowledge, regulation, and relationship.

The integration of quantitative and qualitative data made it possible to move be-yond a reductive view of body awareness as a simple individual skill, showing instead how it is influenced by experience, the structure of the proposed activities, and the perception of an inclusive climate. In particular, the association between higher BAQ scores and a positive perception of the context suggests that attention to the body is fa-cilitated by practice environments that reduce performance pressure and value explo-ration, error, and cooperation. From this perspective, body awareness can be interpreted not only as a prerequisite for performance, but also as an educational outcome of sport practice, in line with a conception of judo that is consistent with its original principles of holistic personal development.

At the applied level, the findings highlight the importance of intentional instruc-tional design that integrates technical and perceptual objectives, making explicit the bodily processes involved in learning. Activities such as controlled ukemi, exploratory work on kuzushi, thematic randori, and guided reflection moments do not merely facili-tate technical learning, but also contribute to stabilizing a more continuous form of bodily attention that can be transferred to situations of greater complexity. From this perspective, body awareness can be considered a transversal competence, relevant not only to performance, but also to self-regulation, injury prevention, and overall athlete well-being.

Alongside these contributions, several limitations of the study should be acknowledged. First, the sample size and its derivation from a single sport context limit the generalizability of the findings. Second, the use of a self-report instrument such as the BAQ, although validated, exposes the quantitative data to potential biases related to social desirability and reflective awareness. Moreover,

the cross-sectional design does not allow causal relationships between practice, inclusive climate, and the development of body awareness to be established. Finally, the Index for Inclusion, while offering a meaningful reading of the context, does not fully capture the complexity of relational and pedagogical dynamics present in sport settings.

In light of these limitations, future research directions could include longitudinal studies capable of observing the evolution of body awareness over time, as well as comparisons across different sport disciplines or contexts with different instructional approaches. It would also be desirable to integrate more ecological and objective measures (e.g., dynamic balance tests, internal load indicators, or psychophysiological measures) to further investigate the relationship between bodily perception, perfor-mance, and self-regulation. An additional line of inquiry could focus on the role of in-structors and pedagogical practices in the construction of inclusive environments, in order to better understand how specific methodological choices influence athletes' bodily experience. This study contributes to the literature on combat sports by proposing an integrated reading of body awareness in judo, highlighting its formative and rela-tional value in addition to its performance-related aspects. Body awareness emerges as a key dimension of an educational and sustainable sport practice, capable of combining technical effectiveness, well-being, and inclusion.

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From Digital Interaction to Emotional Awareness: Artificial Intelligence, Non-Cognitive Skills and Cyberbullying

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The widespread diffusion of digital technologies has transformed educational contexts, reshaping how students communicate, learn, and build social relationships. While digital platforms and social networks offer important opportunities for participation and access to knowledge, they have also contributed to new forms of relational vulnerability. Within this scenario, bullying and cyberbullying represent major educational challenges, negatively affecting psychological well-being, academic achievement, and school life. Cyberbullying differs from traditional bullying because it transcends the temporal and spatial boundaries of school, amplifying the impact of aggression through online dissemination. These phenomena are often associated with limited socio-emotional competencies, including empathy, emotional self-regulation, and conflict management. At the same time, artificial intelligence, social robotics, and emotionally aware technologies are redefining the relationship between education, learning, and social interaction. Although these tools may foster empathy and relational awareness, they also raise ethical concerns regarding emotional simulation, privacy, and the authenticity of human relationships. Against this background, the present study examined the relationship between non-cognitive skills, digital affective literacy, cyberbullying, and emerging technologies, emphasizing the strategic role of teacher training in creating inclusive educational environments.

The study adopted a comparative cross-sectional design involving six upper secondary schools from Italy, Spain, France, Germany, Greece, and the United Kingdom. A mixed-methods approach combined standardized questionnaires and semi-structured interviews. The sample included 684 participants, comprising 592 students aged 14–18 years and 92 teachers. Measures assessed bullying, cyberbullying, socio-emotional competencies, empathy, digital affective literacy, school climate, and attitudes toward artificial intelligence. Data were analyzed using descriptive statistics, ANOVA, correlations, regression analyses, and thematic analysis.

The results revealed significant gender differences. Male students reported higher levels of bullying and cyberbullying, whereas female students showed higher levels of empathy, socio-emotional competencies, and digital affective literacy. Female students also expressed greater ethical concerns regarding artificial intelligence. Cross-national analyses indicated that students from Germany and the United Kingdom reported higher socio-emotional competencies, digital affective literacy, and more positive perceptions of school climate, whereas students from Italy and Greece reported higher levels of cybervictimization. Academic high school students demonstrated stronger socio-emotional and digital competencies than vocational school students.

Correlation analyses showed positive associations among empathy, socio-emotional competencies, digital affective literacy, and school climate, while all these variables were negatively associated with cyberbullying. Regression analyses identified lower emotional self-regulation, empathy, and digital affective literacy as the strongest predictors of cyberaggressive behavior. Conversely, a positive school climate emerged as a protective factor against both cyberaggression and cybervictimization. Among teachers, participation in training programs related to digital education, bullying prevention, and artificial intelligence significantly predicted higher perceived efficacy in managing online relational dynamics. Qualitative findings highlighted emotional disconnection in online communication, empathy as a protective factor, ambivalent perceptions of artificial intelligence, the need for structured teacher training, and the importance of school climate.

The findings confirm that cyberbullying should not be understood solely as a technological issue but as a relational and educational phenomenon closely linked to socio-emotional development. Empathy,

emotional self-regulation, and digital affective literacy emerged as key protective factors capable of reducing involvement in aggressive online behaviors. Digital affective literacy, defined as the ability to recognize and manage emotions in technology-mediated interactions, appears particularly relevant for responsible and inclusive digital citizenship. Emerging technologies, including artificial intelligence, may support educational pathways aimed at strengthening empathy and relational awareness; however, their educational value depends on the pedagogical frameworks guiding their use and cannot replace meaningful human relationships.

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AR Concept Map in Primary School: A Pilot Study with SMapp

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This pilot study investigated the effectiveness of SMapp, an NFC-based augmented reality (AR) concept map system, in supporting learning outcomes and situational interest in primary school education. Although AR technologies are increasingly used in educational contexts, evidence on their effectiveness in primary school remains limited, particularly in terms of measurable learning gains.
The study is grounded in Cognitive Load Theory and embodied cognition perspectives. Cognitive Load Theory (Sweller, 2011; Paas et al., 2003) emphasizes that learning is optimized when instructional design reduces extraneous cognitive load and supports germane processing. Embodied cognition (Wilson, 2002; Barsalou, 2008; Lindgren & Johnson-Glenberg, 2013) highlights the role of physical interaction and sensorimotor engagement in shaping cognitive processes and strengthening conceptual understanding. Within this framework, AR environments may enhance learning by integrating physical manipulation and digital augmentation.
SMapp is an educational system that combines paper-based concept maps with NFC-triggered multimedia content accessible via smartphone. Students interact with printed maps placed on an NFC-enabled support, activating digital content through physical movement of the device. This design aims to promote active learning while maintaining the structure of traditional instructional materials.
A quasi-experimental within-subjects pretest–posttest design was adopted. The sample consisted of 22 students attending fourth and fifth grade in a primary school in Italy. Participants completed an individual learning session on the Solar System using SMapp. Learning outcomes were assessed through a 10-item multiple-choice knowledge test administered before and after the intervention. Situational interest was measured using a 5-point Likert scale, also administered pre- and post-intervention.
Data were analyzed using repeated-measures ANOVA. Results showed a significant improvement in learning outcomes from pre-test to post-test, indicating that students benefited from interaction with the AR system. No significant differences were found between male and female students. However, fifth-grade students performed better than fourth-grade students, likely due to differences in prior knowledge or cognitive development. Situational interest remained stable over time, suggesting that the intervention did not significantly affect students' motivational disposition toward the topic.
These findings suggest that SMapp can effectively support knowledge acquisition in primary education. The observed learning gains may be explained by reduced extraneous cognitive load through structured multimodal representation and by embodied interaction processes activated during use of the system. The combination of tangible and digital elements likely facilitated more meaningful engagement with learning content.
Despite these promising results, the study has limitations, including a small sample size, absence of a control group, and the use of non-validated measurement instruments. These factors limit generalizability and causal interpretation of the findings.
In conclusion, this pilot study provides preliminary evidence that NFC-based AR concept map systems can enhance learning outcomes in primary school while maintaining stable levels of student interest.

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Multilingualism and Multisensory Technologies: Towards Inclusive Digital Language Learning

Liguori Fabrizio
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The growing prevalence of digital technologies and the increasing linguistic diversity of contemporary societies are profoundly changing the processes of language teaching and learning (Piccardo, 2019). Against this backdrop, multilingualism and multisensory technologies represent two closely interlinked dimensions, capable of contributing to the creation of educational environments that are more inclusive, participatory and geared towards the development of language skills (Kress, 2021).

This paper presents a review of the international literature with the aim of analysing the relationship between multilingualism and digital technologies, with particular reference to immersive environments, artificial intelligence systems and Digital Language Learning Ecosystems (Pinto-Llorente & Alvarez, 2024). The analysis takes into account theoretical studies, meta-analyses and systematic reviews published in recent years, linking the main findings of research on language learning with the latest technological innovations.

The theoretical framework highlights how multilingualism can no longer be interpreted solely as knowledge of multiple languages, but as a dynamic competence that enables individuals to draw upon their entire linguistic repertoire in different communicative situations. From this perspective, studies on translanguaging (Wei, 2018)—which describe the flexible and integrated use of linguistic resources—and European educational policies promoting multilingualism as a fundamental element of educational inclusion take on particular significance.

The literature also highlights numerous cognitive benefits associated with multilingualism, including greater cognitive flexibility, increased metalinguistic awareness, improved executive control skills and greater adaptability in managing information from different sources (Barac & Bialystok, 2012). These skills are particularly relevant in today's digital environments, characterised by multimodal communication, the constant switching between linguistic codes and increasing informational complexity.

At the same time, the development of immersive technologies is profoundly transforming the ways in which languages are learnt. The most recent research shows that tools such as Virtual Reality (VR), Augmented Reality (AR), artificial intelligence-based chatbots (Gu, 2025), and Digital Storytelling promote learning processes that are more contextualised, experiential and participatory (Ma & Zhang, 2024). Language learning, in fact, takes place through interaction with realistic environments, the completion of authentic tasks and the simultaneous integration of visual, auditory and, in some cases, motor stimuli.

These findings are firmly grounded in the theoretical framework of Embodied Cognition, which holds that cognitive and linguistic processes emerge from the dynamic interaction between mind, body and environment (Reggin *et al.*, 2023). The association between language, action and multisensory experience promotes the construction of more stable and meaningful cognitive representations, contributing both to vocabulary acquisition and to the development of communicative skills.

Particular attention is also paid to Digital Language Learning Ecosystems, understood as digital ecosystems in which online platforms, collaborative tools, artificial intelligence and immersive environments expand opportunities for language exposure and intercultural interaction. In such contexts, the teacher's role progressively evolves from that of a mere transmitter of content to a designer of learning experiences and a facilitator of collaborative processes, guiding students towards a critical and informed use of technologies (Nguyen & Tuamsuk, 2022).

The evidence analysed suggests that the relationship between multilingualism and multisensory technologies should not be interpreted in purely instrumental terms. Digital technologies are not merely tools to support language learning; they help to redefine the ways in which language is constructed, shared and used (Ho, 2024). At the same time, multilingualism constitutes a cognitive resource that enables students to navigate the multimodal communicative environments typical of digital society more effectively (Chen et al., 2022).

However, certain challenges remain regarding the accessibility of technologies, teacher training, the digital divide and the ethical implications associated with the growing prevalence of artificial intelligence systems. For this reason, it appears necessary to promote further empirical and longitudinal studies aimed at gaining a deeper understanding of the effects of multisensory technologies on the development of language skills and on the creation of truly inclusive educational ecosystems.

Overall, the literature suggests that the integration of multilingualism and multisensory technologies may represent one of the most promising avenues for rethinking language teaching in the 21st century, by promoting learning environments in which linguistic diversity, multimodality and technological innovation serve as complementary resources to foster inclusion, participation and educational success.

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Digital and Physical Learning Spaces for Student Athletes

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The concept of *a dual career* in sport defines the requirement that elite athletes must be able to develop a high-level competitive career within a continuous and permanent professional project. This path must be integrated with the pursuit of educational and personal goals, promoting social inclusion and personal development. However, the complexity of the performance demanded of Olympic and professional athletes today requires an almost exclusive dedication that absorbs almost all of their time, drastically limiting opportunities in formal education pathways. The main vulnerabilities of this path relate to psychophysical factors (performance pressure, *overload* stress) and *governance* deficits, understood as fragmentation between academic and sporting institutions. To safeguard the right to education, athletes must not be faced with a dichotomous choice between competitive success and an academic qualification: digital technologies, e-learning and the paradigms of Universal Design for Learning represent priority strategic objectives in this scenario.

Phygital Ecosystem

Dual Career 2.0 goes beyond the mere archiving of files on e-learning platforms, taking the form of a genuine Phygital Learning Ecosystem. In this context, the boundaries between the training ground and the classroom become blurred. This approach is necessary to address three critical challenges, starting with time pressure: elite athletes devote between 20 and 30 hours a week to training. The digital space allows content to be accessed on the move during travel by bus, plane or in hotels, transforming 'wasted time' into 'productive time'. An effective *phygital* educational ecosystem must address the so-called "3 I's": Immediacy: Instant availability of digital information in the physical space (e.g. QR codes in technical centres linking to theoretical lessons on the biomechanics of exercises). Immersion: Deep user engagement, including through the use of Virtual Reality (VR) to participate in remote workshops. Interaction: Two-way exchange between the two worlds, where, for example, biometric performance data can be transformed into academic study material. This synergy is complemented by a rethinking of the physical space, which ceases to be a place of 'forced confinement' and becomes a hub of services. The design of flexible, wired and quiet classrooms in training centres allows for the transition from physical to mental exertion without the disruption of a radical change of context. From an application perspective, the merging of contexts is driven by integrated technological solutions. Sports-academic management platforms such as *Teamworks* demonstrate the effectiveness of real-time synchronisation (*SIS Integration*) with university information systems (Canvas, Blackboard), centralising deadlines and study programmes to reduce the cognitive load associated with administrative tasks. Automated physical attendance systems via QR codes or *geofencing* immediately notify tutors of study activity, optimising administrative workflows. At the same time, the customisation of LMS systems such as *Moodle* enhances the quality of teaching. A *Mobile-First* environment structured for the *Dual Career* is based on:

1. Offline Learning & Sync: The ability to download lessons and quizzes for use whilst travelling without connectivity, with automatic saving upon first Wi-Fi signal.
2. Micro-learning: Intelligent *chunking* of content into 10-15 minute 'bites', accessible during breaks between training sessions.
3. Adaptive Learning Paths: Pathways capable of adjusting the intellectual effort according to physical workload, prioritising audio lessons or summaries during periods of peak competitive pressure.

This linearity reduces extraneous cognitive load: the student does not waste mental energy trying to figure out 'how' to navigate the interface, being able to enter the learning *flow* state immediately. From a pedagogical and sociological perspective, the intersection between physical and digital spaces evokes the Third Space Theory formulated by Edward Soja and Homi Bhabha. Bhabha introduces the concept of 'hybridity', defining the Third Space as a liminal place where different cultures meet, allowing new identities to emerge. In our scenario, it represents the exact point where sporting and academic identities cease to be in conflict. Soja (1996) articulates a tripartite spatial vision: *Firstspace* (physical/material space), *Secondspace* (mental/imagined space) and *Thirdspace* (lived space, where the real, the imagined, the digital and the physical converge). Digital technology breaks down the rigid dichotomy between 'being in the classroom' and 'being away on match duty'. Mobile platforms function as a 'Third Navigational Space' that allows the athlete to move fluidly between different institutions without fragmenting their identity, thereby preventing the risk of *burnout* or early dropout.

Conclusions

The integrated design of spaces in a post-digital era ceases to be a mere logistical measure and becomes an indispensable pedagogical pillar. The proposed institutional framework outlines a model in which spatial flexibility acts as a strategic resource to ensure educational equity. Structuring a *phygital* ecosystem means protecting the student-athlete's mental and physical well-being, validating their dual identity and transforming technological potential into a real factor for educational and sporting success.

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Beyond self-report: evaluating authentic ai literacy in a continuing education context

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Generative AI tools have moved rapidly into professional and organizational practice, outpacing individuals' capacity to use them well. Fluent, superficially convincing outputs foster automation bias, the tendency to over-rely on automated systems and miss the errors they introduce (Goddard et al., 2012); field-experimental evidence shows AI assistance boosts performance within its current capability while just as reliably degrading it outside that boundary, a limit users cannot detect from fluency alone (Dell'Acqua et al., 2023; Fernandes et al., 2026). This motivates closer scrutiny of how AI literacy is measured. Most existing instruments rely entirely on self-report, including for the cognitive dimension (Ng et al., 2024), and show weak correlations with independently developed objective performance tests (Koch et al., 2024), with self-assessment errors that are not uniformly directional (Zhang et al., 2026).

To date, no AI literacy instrument has been developed and validated specifically for adult professionals in organizational settings. This study addresses that gap by asking: how do business professionals assess their own ability to use, interpret, and engage with AI, and does this differ from externally evaluated performance? And how can an authentic task operationalize the ABCE dimensions of AI literacy as observable performance indicators in adult professionals?

The study involved 141 professionals (74.5% male; mean age 44.2) enrolled in a Digital Europe Master programme in Advanced Digital Technologies for Business. Participants first completed the AI Literacy Questionnaire (Ng et al., 2024), covering Affective (AL), Behavioural (BL), Cognitive (CL) and Ethical Learning (EL), to which a Socio-Technical Awareness (STA) dimension was added, capturing the ability to recognize that AI outputs reflect training data and design choices rather than being neutral artefacts. A week later, participants completed an authentic task, evaluating two AI-generated employer branding campaigns produced by different LLMs from an identical, generic prompt, replicating real-world AI use without domain-specific guidance. Performance was scored with a four-dimension analytic rubric (Prompt Evaluation, Text Analysis, Image Analysis, Socio-Technical Awareness; 0-3 per dimension, range 0-12), anchored to the literature on bias in AI-generated content, and double-coded by two independent raters (Cohen's κ = .471-.593). A Disposition-Performance Gap (DPG) index quantified the relationship between self-perceived disposition and demonstrated performance, rescaling the mean of the four AILQ dimensions onto the rubric's 0-12 range and subtracting the mean rubric score; it is not framed as metacognitive calibration but as misalignment between a general disposition and a task-specific performance. Three a priori categories were defined: Disposition Surplus (DPG > +3), Alignment (-3 to +3), Performance Surplus (DPG < -3).

All AILQ dimension means fell above the scale midpoint, with EL highest (M=4.49) and STA2 lowest and most variable (M=3.52, SD=0.95). Rubric total scores (M=7.93, SD=2.89) approached the Proficient threshold, with no floor or ceiling effects: 49.6% reached Proficient, 36.9% Developing, 13.5% Naive; Socio-Technical Awareness was consistently the lowest-scoring dimension, and the two AI systems did not differ significantly. At the aggregate level, the DPG suggested reasonable calibration (M=+1.36, SD=2.96, within the Alignment zone), with 68.8% Aligned and 27.7% in Disposition Surplus. This picture concealed a sharply threshold-dependent structure: all Naive-level participants fell into Disposition Surplus, while 91.4% of Proficient participants were Aligned and 7.1% showed Performance Surplus, $\chi^2(4)=78.41$, $p<.001$. Overestimation was thus concentrated almost entirely among the lowest performers, while the most competent participants judged their own

ability comparatively accurately.
These findings indicate that self-reported confidence alone cannot identify individuals most likely to over-rely on AI output: demonstrated performance must be measured directly. The study supports performance-based, authentic-task assessment as a necessary complement to self-report instruments, and proposes the DPG as a preliminary, exploratory tool for identifying professionals whose disposition toward AI outpaces their demonstrated critical-evaluation competence. Limitations include the single-programme, cross-sectional design and the specific scenario and rubric used; future research should adopt longitudinal designs, more diverse samples, and additional authentic tasks and AI systems.

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Embracing the enigma and learning through emotions. Digital escape rooms as narrative, multisensory, and challenge-based environments in primary school

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Educational research has long moved away from the idea that learning simply means accumulating disciplinary content in a procedural way. Learning is, above all, a situated experience. It takes shape in relationship. It is nourished by what the pupil feels while facing a task, and it consolidates or crumbles depending on the emotional experience that accompanies cognitive effort. As early as 1938, Dewey traced knowledge back to a continuous process of reconstructing experience, rather than to a simple transfer of notions from one subject to another. This insight, reread today through the lens of achievement emotions (Pekrun, 2006; Pekrun et al., 2011), helps explain why motivation, perceived competence, and persistence in the face of complexity are not accessory variables of learning. They are, rather, its constitutive components. From this perspective, the digital escape room can be something more than a simple gamification strategy designed for entertainment. It is a complex, multisensory environment. A puzzle to inhabit, in which narrative, digital interaction, peer collaboration, and the management of uncertainty work together to construct disciplinary meaning (Makri et al., 2021; Taraldsen et al., 2022; Veldkamp et al., 2020). The present study aims to verify whether, and to what extent, a digital and narrative learning environment such as the escape room, compared with traditional teaching, fosters not only improved statistical learning outcomes, but also a different quality of pupils' emotional and motivational experience. A quasi-experimental pretest-posttest design with a comparison group was adopted, involving two fourth-grade classes in a primary school in the province of Cosenza engaged in a teaching unit on statistics. The experimental group followed the unit through digital escape rooms specifically designed by the teachers; the comparison group covered the same content through traditional methods. Learning outcomes were assessed through a purpose-built test in two parallel forms, addressing the same conceptual core and designed with comparable structure and difficulty. Both tests were completed by 36 pupils (17 experimental; 19 comparison). Motivation was assessed through the AMOS 8-15 questionnaire (Cornoldi et al., 2022), which yields a profile across seven areas: motivation, organisation, strategic elaboration, flexibility, concentration, anxiety, and attitude toward school. The learning results show a clear difference between the two groups. The experimental group recorded an average gain of more than twenty points between the pretest and the posttest, compared with an average gain of about seven points in the comparison group. The two groups started from substantially equivalent baseline levels, so the gap that opens by the end of the unit appears attributable to the teaching intervention rather than to an initial advantage. The motivational picture returned by the AMOS is more nuanced. No clear, consistent shift in the expected direction emerges across all areas of the questionnaire. Motivation, strategic elaboration, and attitude toward school show a slight improvement in the experimental group that is not observed in the comparison group. Concentration and anxiety management, by contrast, remain substantially stable in both groups. Rather than weakening the learning results, this finding opens a reflection worth pursuing further. Self-reported motivational perception, captured through a standardised instrument, appears to move on a different timescale than the cognitive gain observable over the short period of a circumscribed teaching intervention. The first finding, on learning, indicates that a well-designed digital escape room can produce a cognitive gain greater than that of traditional teaching, even for a challenging content area such as statistics. This is not a foregone result, and it confirms what recent literature has been reporting on the potential of these environments (Fotaris & Mastoras, 2019). The second finding, on motivation, calls for caution. The gap between a clear cognitive improvement and a slower-moving motivational perception may depend on the timing of AMOS administration, which is removed from the moments of emotional

engagement experienced during play. A possible interpretive key comes from Csikszentmihalyi's (1990) work in a domain other than schooling, according to which states of full engagement in a challenging activity are experienced intensely, yet remain difficult to capture retrospectively through self-assessment instruments administered after some time has elapsed. A similar gap between experience and measurement may have played a role in this study as well: an immersive, playful environment produces rapid cognitive effects, but its motivational impact requires finer-grained observation over time. The ongoing research, which will be the subject of a more extensive study, aims to investigate this gap more precisely, to establish whether the experience lived during the escape room might offer more sensitive indicators of motivational experience than a questionnaire administered once the intervention has concluded.

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Human-Centered Automl for Early Student Dropout Prediction in Higher Education

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Student attrition in higher education represents one of the most persistent and socially consequential challenges facing academic institutions worldwide (Fahd et al., 2022; Valencia-Arias et al., 2025). Despite sustained policy investment, dropout rates remain high, and existing predictive systems often fail to translate statistical accuracy into institutionally actionable insight. This contribution argues that the central advance of the present work lies not in performance gains alone, but in a principled reconceptualization of what responsible dropout prediction requires — epistemologically, methodologically, and ethically. The dominant paradigm in educational machine learning has treated dropout prediction as a technical classification problem, optimizing accuracy while underspecifying fairness, interpretability, and temporal robustness (Weerts et al., 2024; Reddy, 2025). The proposed AutoML 3.0 framework disrupts this paradigm by embedding the prediction pipeline within a multi-theoretical psycho-pedagogical foundation. Tinto's (2012) Student Integration Theory, Astin's (2014) Involvement Theory, and Bean and Eaton's (2001) psychological model collectively inform the feature engineering strategy: GPA trajectories operationalize academic integration; LMS engagement intensity indexes behavioural involvement; enrolment continuity reflects persistence dynamics. This alignment between theoretical constructs and observable variables is not merely formal — it is what renders SHAP-derived explanations institutionally legible. When declining GPA co-occurs with reduced engagement and enrolment instability, the framework identifies not an arbitrary statistical pattern but the observable signature of motivational disengagement, self-efficacy erosion (Bernardo et al., 2025), and weakening academic belonging — processes that educators can recognize and address. The fairness audit constitutes a second distinctive contribution. Baseline models exhibited substantial age bias, with false negative rates for students aged ≥ 30 reaching 0.38 (Logistic Regression) and 0.29 (Random Forest). The AutoML 3.0 framework reduced this to 0.22 — an 18% improvement — while maintaining gender parity below the 5% threshold and compressing the Equalized Odds gap from 0.17 to 0.06. These results are theoretically coherent: mature students face qualitatively distinct risk profiles shaped by competing life demands, weaker sense of institutional belonging, and heightened socioeconomic vulnerability (Milcu, 2025). A system that systematically under-flags their risk not only performs poorly — it perpetuates structural disadvantage. The fairness-aware model search integrated within EDCA directly mitigates this. The methodological contribution of temporal cohort validation addresses a critical but underacknowledged flaw in existing literature. As documented by Berens et al. (2025) across over 460,000 enrolment records, random cross-validation in longitudinal datasets inflates macro-F1 estimates by up to 12 points. By training in 2014–2018 cohorts and evaluating in 2019–2021 cohorts under rolling-origin cross-validation, the framework produces performance claims — 0.802 accuracy, 0.740 macro-F1, Brier score 0.14 — that reflect genuine predictive capacity under deployment-realistic conditions. Finally, in the European regulatory context, the EU AI Act (European Parliament, 2024) classifies AI-based student monitoring systems as high-risk, mandating transparency, human oversight, and non-discrimination. The framework's SHAP explainability, multi-dimensional fairness auditing, and educator-in-the-loop validation directly address these requirements — constituting a model for EU AI Act-aligned educational analytics. Future work should extend the fairness audit to intersectional subgroups, integrate federated learning for privacy-preserving multi-institutional deployment (Berens et al., 2025), and develop empirically validated educator-facing dashboards that operationalize uncertainty-calibrated predictions at the institutional level (Weerts et al., 2024).

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Advancing Learning Analytics through Quantum-Enhanced Machine Learning: A Framework for Dropout Prediction and Intervention

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The framework proposed by the authors establishes a compelling empirical case for regime-dependent quantum contribution in learning analytics, yet its translation into institutional practice hinges on a dimension the study itself flags as underdeveloped: the interpretability of the hybrid stacking mechanism for non-technical stakeholders. While the meta-learner's fusion weights offer a mathematically transparent signal of quantum-classical complementarity (Biamonte et al., 2017), academic advisors and student support staff require pedagogically legible explanations, not coefficient trajectories, to act on early-warning outputs. This gap is consequential precisely because the study grounds its features in Tinto's (2012) integration model and Zimmerman's (2000) self-regulated learning theory: a prediction is only actionable if the intervention it triggers targets the correct psycho-pedagogical mechanism. A promising extension would couple the hybrid architecture with a post-hoc explanation layer mapping each feature category — behavioural engagement, academic integration, and sociodemographic — back onto its theoretical construct at the point of prediction. For instance, when the QSVM component dominates the fusion weight in the 200–300 sample regime, this could indicate that quantum kernels are capturing nonlinear interactions between session irregularity and submission lateness that classical models underweight, consistent with Schuld and Killoran's (2019) theoretical account of quantum feature maps accessing decision boundaries beyond classical kernel capacity. Surfacing this as "irregular engagement combined with declining assessment performance" rather than a numeric weight would align directly with Zimmerman's (2000) emphasis on the self-reflection phase, where students exhibit compounding, not isolated, regulatory failures. This interpretive layer also addresses the fairness concern the authors rightly raise (Baker & Hawn, 2022). Disaggregating quantum versus classical contribution by demographic subgroup, rather than only by sample-size regime, would reveal whether the quantum kernel's sensitivity to complex feature interactions disproportionately activates for students already flagged by structural variables such as disability status or geographic region (Li & Carroll, 2020). If QSVM weight increases correlate with membership in disadvantaged equity groups, this would not necessarily indicate bias but could reflect genuine behavioural complexity requiring more sophisticated modelling — a distinction only resolvable through disaggregated fusion-weight analysis. Finally, the computational cost profile reported (QSVM runtime scaling from 39.7 to 385.2 seconds) suggests a natural triage protocol: institutions could reserve quantum-augmented inference for the subset of students whose classical model output falls within an ambiguous probability band, rather than running QSVM inference universally. This selective-activation strategy would preserve the demonstrated accuracy gains while containing the quadratic cost growth documented in NISQ-era simulations (Gujju et al., 2024), bridging the regime-dependent advantage identified here with the operational constraints of real institutional deployment — particularly relevant given that early-warning systems alone, absent structured counselling support, have shown limited standalone impact on dropout reduction (Mokhati et al., 2022).

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Design and Experimental Evaluation of an Emotion-Sensitive Hybrid Learning Ecosystem to Promote Psychological and Physical Well-Being in Primary Schools

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The study evaluates an emotion-sensitive hybrid learning environment designed to improve primary school pupils' psychological and physical well-being, emotional regulation and engagement. Its theoretical framework combines educational neuroscience, achievement-emotion theory, Social and Emotional Learning, embodied cognition, affective computing and learning analytics. These perspectives assume that emotions are structurally connected with attention, memory, motivation, decision-making and academic performance. The proposed model therefore integrates physical space, digital technologies and pedagogical practices within a single educational ecosystem.

The main objective was to determine whether an environment capable of detecting and supporting pupils' emotional states could produce better outcomes than traditional teaching. The authors expected pupils in the experimental condition to show greater emotional well-being, stronger engagement, a more positive classroom climate and improved ability to recognise and regulate emotions.

A mixed-methods randomised controlled design was adopted. Fifty pupils aged between eight and ten years, attending two parallel classes in the same urban primary school, were assigned through stratified randomisation to an experimental group and a control group, each composed of twenty-five participants. The groups were balanced by gender and initial academic performance, and no significant baseline differences emerged.

The intervention lasted twelve weeks. The first two weeks were devoted to baseline assessment and classroom observation, the following eight weeks to the full implementation of the hybrid ecosystem, and the final two weeks to consolidation and post-test assessment. The control group continued ordinary teaching without the technologies and structured emotional activities included in the programme.

The experimental environment combined environmental sensors, non-invasive wearable devices, adaptive sensory technologies and teacher-mediated activities. Sensors monitored brightness, noise, temperature, carbon dioxide and air quality, while wearable devices collected heart-rate and heart-rate-variability data as indirect indicators of emotional and physiological arousal. The information was displayed through a teacher dashboard, enabling the identification of possible stress, fatigue or excessive activation and supporting adjustments to classroom activities. Adaptive lighting and natural ambient sounds were also used to improve comfort and concentration. Technology did not replace the teacher, but made emotional and environmental processes more visible and pedagogically manageable.

The activities focused on emotional awareness, self-regulation and reflection. Pupils participated in guided breathing, mindful pauses, metacognitive discussions, emotional diaries and digital storytelling. They learned to name emotions, recognise bodily signals, reflect on difficult situations and apply regulation strategies independently. The programme was grounded in Social and Emotional Learning, self-regulated learning, biofeedback, narrative learning and the TPACK framework.

Quantitative data were collected through validated instruments: the Strengths and Difficulties Questionnaire for behavioural well-being, PANAS-C for positive and negative affect, CLASS for classroom interactions, and engagement scales covering behavioural, emotional and cognitive participation. Qualitative evidence came from systematic observations, teacher interviews and pupils' emotional diaries. Repeated-measures analyses, t-tests, effect sizes and correlations were used for quantitative data, while thematic analysis and triangulation were applied to qualitative material.

The results supported the hypotheses. Positive affect in the experimental group increased from 27.4 to 33.1, whereas the control group showed only a limited change. Negative affect and problem

behaviours decreased significantly among participating pupils. School engagement rose from 3.1 to 3.8 on a five-point scale, compared with a marginal increase from 3.0 to 3.2 in the control group. Emotional support and classroom organisation also improved. Higher positive affect was associated with stronger engagement, while reductions in behavioural difficulties were related to a better classroom climate.

The qualitative findings reinforced the statistical evidence. Four themes emerged: greater emotional awareness, improved peer relationships, stronger self-regulation and a more positive perception of the learning environment. Pupils progressed from generic descriptions of feeling "good" or "bad" to more precise explanations of emotions and their causes. Teachers observed fewer conflicts, more cooperation and greater use of dialogue. Pupils increasingly applied breathing and mindful-pause techniques without direct adult prompting, showing a transition from externally guided regulation to greater autonomy. The classroom was described as quieter, more pleasant and easier to work in, while teachers considered the technological system useful for understanding group dynamics and responding more effectively.

The discussion emphasises that the intervention's effectiveness resulted from the interaction between environment, technology and pedagogy rather than from technology alone. The findings confirm the close relationship between emotional processes and learning and support embodied-cognition perspectives by showing that light, sound, air quality and bodily activation can influence attention, relationships and well-being. The teacher remains central as the professional who interprets data and transforms technological feedback into educational action.

Overall, the study shows that emotionally aware hybrid learning environments can improve pupils' well-being, emotional competence, behaviour, engagement and classroom relationships. Its main contribution is a human-centred educational model in which smart technologies, physical space and socio-emotional teaching practices are deliberately combined. Emotion-sensitive design therefore represents a promising direction for more responsive, inclusive and sustainable primary school education.

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Designing hybrid and emotionally aware learning environments: the contribution of multisensory

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Over the past decades, special pedagogy has progressively moved beyond deficit-oriented interpretations of individual differences, embracing perspectives that recognise neurodiversity as an expression of the natural variability of human functioning (Ferrari & Morandi, 2020; Lo Piccolo & Pellerone, 2020). Within this framework, inclusion is no longer understood as requiring students to adapt to standardised educational models but rather as the design of educational contexts capable of accommodating diverse ways of learning, participating, and developing (Pavone, 2014; Ianes, 2022). Recent advances in educational neuroscience, developmental psychology, and embodied cognition have highlighted the close interconnection between learning, emotions, the body, and the environment, identifying well-being as a structural component of educational processes (Cornoldi, 1995; Confalonieri & Olivari, 2022; Peluso Cassese & Torregiani, 2017). From this perspective, multisensory environments represent an innovative response to the need for inclusive educational settings that foster self-regulation, participation, and the quality of educational experiences.

Among the most established approaches is the Snoezelen model, developed in the Netherlands by Hulsegge and Verheul (1987) and progressively evolving from an environment dedicated to controlled sensory stimulation into an educational setting aimed at promoting well-being and learning (Solomon & Botha, 2024). Recent developments demonstrate that these environments should no longer be regarded merely as spaces for relaxation but rather as contexts in which body, perception, relationships, and cognition are integrated into a unified educational experience, in line with the principles of embodied cognition (Palmiero & Borsellino, 2018). At the same time, the growing diffusion of immersive technologies, intelligent sensory systems, interactive devices, and applications related to affective computing has opened new possibilities for designing hybrid and emotionally aware learning environments capable of dynamically adapting environmental characteristics to individual needs (Picard, 1997; D'Agostini, 2021). However, these innovations acquire educational value only when guided by clear pedagogical intentionality and embedded within meaningful educational relationships.

Against this theoretical background, the present paper reports the findings of a qualitative study conducted within the research activities of the Chair of Special Pedagogy at the University of Enna Kore. The study adopted a multiple-case qualitative design based on systematic non-participant observation (Mantovani, 1998; Baldacci & Frabboni, 2013), carried out in three Snoezelen environments selected through purposeful sampling (Nisbet & Entwistle, 1982): two located in comprehensive schools in Sicily and one within a socio-educational association serving young adults with intellectual disabilities and neurodevelopmental disorders. Overall, eight participants were observed using a structured checklist specifically developed according to the principles of systematic educational observation (Mantovani & Gattico, 2000). The instrument documented the use of multisensory resources, self-regulation processes, the quality of social interactions, participation in educational activities, and communicative behaviours.

The comparative analysis revealed several recurring patterns across the three settings. First, participants showed improvements in emotional and sensory self-regulation, evidenced by a progressive reduction in avoidance behaviours and hyperactivation, increased voluntary engagement within the multisensory environments, and greater willingness to explore the available sensory resources. These changes were particularly evident among participants experiencing greater sensory regulation difficulties. Furthermore, the use of multisensory technologies varied according to individual needs: vibroacoustic devices, optical fibres, tactile surfaces, and proprioceptive materials

promoted increased attention, enhanced emotional regulation, and greater autonomy in selecting sensory strategies. In the two school settings, observations also documented more frequent spontaneous peer interactions and greater participation in shared activities, whereas the association setting highlighted significant improvements in self-determination, collaboration, and social participation.

The differences observed across the three settings confirm the highly flexible nature of multisensory environments. The Caltagirone setting proved particularly effective in promoting relaxation and emotional regulation; the Valverde environment highlighted the educational potential of immersive technologies while requiring continuous personalisation of educational activities; finally, the Riesi association demonstrated that multisensory environments can effectively support personal autonomy and social participation among young adults with disabilities.

Overall, the findings support the interpretation of Snoezelen environments as responsive educational ecosystems in which spatial organisation, pedagogical mediation, sensory technologies, and the quality of interpersonal relationships jointly shape educational experiences oriented towards well-being and inclusion (Weyland, 2017; Vanacore & Gomez Paloma, 2020). In line with contemporary quality-of-life frameworks (Schalock et al., 2021), well-being, learning, and participation emerge as deeply interconnected dimensions of a single developmental process. Although the qualitative nature of the study and the limited number of participants do not allow statistical generalisation, the findings suggest that multisensory environments represent a promising educational paradigm for the development of increasingly inclusive, adaptive, and emotionally aware educational ecosystems, opening new perspectives for integrating special pedagogy, emerging technologies, and inclusive educational design across the lifespan.

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The Algorithmic Heartbeat: The Iep As An Affective Device In Ai-Enhanced Hybrid Learning Environments

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Artificial intelligence is reshaping inclusive education by transforming not only teaching practices but also the epistemological foundations of educational planning. Within AI-enhanced hybrid learning environments, the Individualized Education Plan (IEP) is evolving from an administrative document into an ecosystemic device that connects educational actors, embodied experiences, institutional contexts, and digital infrastructures to foster participation and human flourishing.

This study investigates the epistemological evolution of the IEP between 2003 and 2025, introducing the concept of the algorithmic heartbeat as a pedagogical metaphor describing the circulation of educational information, professional judgments, and collaborative decision-making across inclusive educational ecosystems. Rather than replacing human agency, artificial intelligence is interpreted as a mediating infrastructure that strengthens educational collaboration while preserving pedagogical intentionality, ethical responsibility, and relational care.

The theoretical framework integrates four complementary perspectives: the International Classification of Functioning, Disability and Health (ICF) as the language of functioning; Embodied Cognitive Science as the experiential grammar of learning; the Life Project as the horizon of autonomy, participation, and self-determination; and contemporary research on Artificial Intelligence in Education, which conceptualizes digital technologies as ecosystemic mediators supporting collaborative educational governance.

A qualitative longitudinal case-study design was adopted. Eighteen Individualized Education Plans produced between 2003 and 2025 were analysed across six longitudinal educational trajectories. Documentary analysis explored changes in document structure, educational language, family participation, contextual dimensions, and digital governance. Findings were triangulated with data from an asynchronous online focus group involving teachers, school leaders, parents, and educational professionals, using thematic qualitative analysis.

Results reveal a significant transformation of inclusive educational planning. Early IEPs reflected deficit-oriented and performance-based approaches characterized by fragmented documentation and limited attention to contextual factors. Over time, planning progressively incorporated ICF categories, environmental facilitators, collaborative practices, and digitally mediated documentation. Educational language shifted from prescriptive descriptions of performance toward relational narratives emphasizing participation, agency, contextual interaction, and shared responsibility.

The transition from paper-based documentation to the national digital IEP represents an epistemological rather than merely technological change. Educational planning becomes collaborative, traceable, and longitudinally coherent, enabling the integration of professional expertise, family knowledge, contextual observations, and educational trajectories within shared digital environments. In this perspective, the IEP functions as an ecosystemic infrastructure linking schools, families, healthcare services, communities, and AI-supported educational systems.

The proposed concept of the algorithmic heartbeat explains this transformation by describing the continuous coordination of information, relationships, and educational intentions throughout the inclusive ecosystem. The algorithmic dimension refers to the organization of complex educational processes rather than the automation of pedagogical decisions, reaffirming the centrality of human interpretation, professional judgment, and ethical responsibility.

The findings suggest that the future of inclusive education depends less on technological innovation itself than on the capacity to develop ecosystemic models of educational governance in which artificial intelligence supports collaboration, reflection, and shared responsibility. The proposed framework positions the IEP as the algorithmic heartbeat of inclusive educational ecosystems, integrating ICF-based functioning, embodied cognition, Life Project trajectories, and AI-enhanced mediation within a coherent pedagogical architecture. This reconceptualization contributes to contemporary debates on inclusive education by framing digital educational planning as a human-centred process in which technology enhances, rather than replaces, educational relationships and collective responsibility.

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Outdoor education and artificial intelligence: an integrated pedagogical framework for personalized, situated, and sustainable learning

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The integration of artificial intelligence (AI) into education raises questions about technological innovation, knowledge construction, environmental awareness, and active participation. Outdoor Education similarly extends learning beyond the classroom through observation, inquiry, embodied experience, and interaction with natural environments. Their convergence raises a key question: how can AI enhance outdoor learning without replacing direct sensory, physical, and social experiences? This paper develops the theoretical and methodological foundations of an AI-enhanced Outdoor Education model grounded in experiential and situated learning, embodied cognition, Human-Centred AI, and technological complementarity. Particular attention is given to different educational stages. In early childhood, Forest Kindergartens and Nature Preschools emphasise autonomous exploration, free play, movement, sensory experience, and interaction with natural materials. AI should therefore remain primarily teacher-mediated, supporting documentation, planning, assessment, and reflection rather than children's direct experience of nature.

The framework considers nature an active component of learning. Interaction with natural phenomena, organisms, materials, sounds, and environmental variability integrates perception, movement, language, decision-making, and social interaction. Outdoor Education can consequently foster scientific inquiry and transversal competences when experiences are connected to curricular objectives. At the same time, AI applications such as generative AI, multimodal systems, learning analytics, and automated classification raise concerns about transparency, privacy, bias, reliability, and excessive technological mediation. In outdoor contexts, AI-generated interpretations may introduce errors or premature conclusions; outputs should therefore be treated as hypotheses requiring empirical verification. The proposed model defines five AI functions: scaffolding research questions; supporting differentiation and accessibility; assisting environmental recognition and classification; organising data; and promoting metacognitive reflection. These functions follow five Human-Centred AI principles: necessity, proportionality, intelligibility, reversibility, and verifiability. AI should be used only when pedagogically necessary, with limited screen exposure and data collection, understandable functioning, activities that remain meaningful without technology, and systematic comparison between AI outputs and direct evidence.

The model is organised into six phases: orientation; anticipation, activating prior knowledge and formulating hypotheses independently of AI; embodied exploration, prioritising observation, sensory experience, movement, play, measurement, and data collection; assisted inquiry, using AI for classification, comparison, questioning, and interpretation; critical validation, comparing AI outputs with observations, scientific sources, experts, and educators; and reflection and dissemination, transforming experience into shared knowledge. Its methodological principle is: "observe first, human in the loop, validation required."

A systematic review following PRISMA 2020 and PRISMA-S included twelve studies. Findings show that research at the intersection of AI and Outdoor Education remains at an early stage, with particularly limited evidence in early childhood. Existing studies focus mainly on secondary education and research contexts, where AI supports environmental data analysis, classification, citizen science, documentation, and educational practice.

These findings inform a three-phase mixed-methods quasi-experimental programme. First, participatory co-design and feasibility testing will examine teacher-mediated AI use in early childhood and AI-supported citizen science in secondary education, addressing accessibility, screen exposure,

teacher workload, sustainability, and technological mediation. Second, three conditions will be compared: AI-enhanced Outdoor Education, Outdoor Education without AI, and predominantly indoor teaching. Outcomes will include disciplinary learning, executive functions, motor development, connection with nature, agency, socio-emotional regulation, and critical AI literacy. Third, longitudinal research will examine persistence, transfer, independent application of competences, and ecological awareness.

Overall, AI's educational value in Outdoor Education depends less on the amount of technology than on the quality and timing of its integration. AI can enhance inquiry, interpretation, documentation, and reflection when it provides genuine educational value, but becomes problematic when it anticipates answers, reduces uncertainty, increases screen dependence, or replaces direct observation. The framework therefore adopts technological subsidiarity, keeping AI subordinate to human judgement, empirical experience, and the educational relationship.

The study connects digital innovation with environmental and experiential pedagogy across the educational lifespan. AI and nature are conceptualised as complementary elements of an ecology of learning in which technology supports, rather than replaces, authentic experience. The model offers a basis for advancing science and sustainability education, digital and AI literacy, and responsible technological citizenship, while guiding future empirical research on ethical, developmentally appropriate, and pedagogically grounded AI integration in Outdoor Education.

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Human Mediation and Technical–Procedural Learning in the Age of AI: A Retrospective Study of a Peer-Led BLS Program in an Italian Lower-Secondary School

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This paper reports an exploratory, retrospective study of a school-based Basic Life Support (BLS) program delivered to lower-secondary students through a blended model that paired direct instruction from a certified instructor with hands-on practice guided by near-peer educators. The study is situated within a multi-year effort to embed BLS in the curriculum, developed at I.I.S. Aldini Valeriani (Bologna) and extended across a regional school network between 2020 and 2025; the initiative reached more than twelve thousand students and community members. Within this broader effort, the empirical site is a survey administered at IC Granarolo dell'Emilia about three months after a peer-led BLS session.

Conceptually, it engages debates about the transformation of educational mediation as AI grows more pervasive (Mustafa et al., 2024). It does not evaluate an AI-based tool, nor does it measure students' attitudes toward such technologies; rather, it treats algorithmic mediation as a problematic backdrop against which to ask what human mediation contributes to the learning of embodied technical procedures. BLS is an instructive case, integrating conceptual knowledge, operational sequences, bodily gestures, technical parameters, situated coordination, and the use of devices such as the automated external defibrillator (AED). Drawing on Floridi's (2014) account of the infosphere and Picard's (1997) work on affective computing, it locates its guiding question at the boundary between an affectively plausible response and a situated educational relationship—without framing human relationship and technology as opposites.

The design is descriptive and exploratory, based on a delayed survey administered approximately three months after the intervention. It does not estimate the intervention's causal efficacy but documents which procedural knowledge remained recognizable and how students retrospectively appraised their learning. The survey was completed by 93 students; after one exclusion, the analytical sample comprised 92 students across five Year 9 classes. The instrument included seven single-answer items assessing recognition of correct actions in the BLS sequence and three multiple-response items addressing the hands-on experience with the peer educator, perceived confidence, and the relationship between theory and practice. Responses were analyzed using frequencies, percentages, means, and standard deviations; open-ended responses served as supporting qualitative evidence.

The findings indicate strong recognition of the core procedural actions of BLS. Five of the seven items exceeded 96% correct: scene safety, role allocation, calling the emergency number (112) on speakerphone while initiating compressions, interrupting compressions only when appropriate, and the function of the AED. The mean total score was 5.93 of 7 (SD = 0.85), and 77.2% of students answered at least six items correctly. Two weaknesses emerged: recognition of how to perform compressions reached 75.0% correct, whereas recognition of the correct compression rate, as defined by current resuscitation guidelines (Smyth et al., 2025), fell to 31.5%. This pattern suggests that situated operational decisions are more durably recognized than a discrete technical–numerical parameter.

Responses concerning the hands-on experience indicate that the value students attached to the peer educator did not rest primarily on age proximity. Only 16.3% selected "knowing it was a student like me," whereas 89.1% identified watching the peer educator perform the maneuvers and receiving corrections during practice as helpful. Similarly, perceived confidence was associated above all with immediate correction (60.9%) and the opportunity to observe a model first (55.4%), rather than with the non-evaluative character of the activity alone (21.7%). The theoretical component was not

discounted: 64.1% acknowledged that it helped them understand why the procedure matters, even as they regarded practice as the more useful component.
Taken together, the study suggests that, in BLS, the relevant relational mediation is not the mere presence of a peer but a configuration of modeling, observation, immediate feedback, error correction, and guided action (Kesici et al., 2021; Widnall et al., 2024). These functions offer a vantage point on the relationship between human and algorithmic mediation: some forms of support may be simulated or technologically assisted, whereas others appear to presuppose bodily co-presence, pedagogical responsibility, and situated correction. The design's limitations—no pretest, immediate posttest, or comparison group; recognition items rather than performance assessments; and the retrospective nature of the perceptions—preclude causal inference. This distinction nonetheless gains salience as young people are increasingly exposed to systems that return affectively plausible responses: the findings offer descriptive evidence to inform subsequent research on school-based BLS, peer mediation, human feedback, and digital supports.

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Open Digital Spaces as Emotionally Aware Learning Environments: A Collaborative Experience in TFA Programs

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The spread of digital technologies and artificial intelligence is profoundly transforming educational processes, necessitating a shift away from an exclusively technocentric view of innovation. As Selwyn (2016) and Floridi (2014) highlight, technologies are not mere tools, but environments that influence the construction of knowledge, relationships, and professional identities.

The literature highlights how emotions, trust, and a sense of belonging significantly influence participation in digital environments (Zembylas ,2015). From this perspective, social presence (Garrison, Anderson, & Archer, 2000) and psychological safety (Edmondson, 1999) become important.

This paper analyses the role of an open digital space in building an emotionally aware learning environment within the specialisation courses for support activities (TFA).

Methodology

The research adopts a qualitative action research approach supported by descriptive quantitative data. The study involved 1,500 students enrolled in TFA programs from different Italian regions.

The learning environment was built around Padlet, used as an open collaborative space and integrated with tools for instructional design and multimodal content production, including Canva, StoryJumper, Book Creator, Google Workspace, and generative artificial intelligence applications.

Evidence collection included participant observation, educational digital ethnography, analysis of over 4,000 digital artifacts, and a final anonymous questionnaire consisting of 19 items. The questionnaire was completed by all participants involved in the study (N = 1,500), as it constituted the final activity of the training programme. Qualitative evidence was analyzed using thematic analysis proposed by Braun and Clarke (2006).

Results

The initial conditions revealed participants' limited familiarity with digital collaborative environments: 88% stated they were unfamiliar with Padlet and 84% had never shared teaching materials publicly. The main resistances were related to fear of judgment and a perceived professional vulnerability.

Over the course of the experience, these barriers gradually diminished. 96% of participants perceived Padlet as an effective learning space, 94% as a collaborative environment, and 92% as a professional community. Consulting shared materials fostered new teaching ideas (95%), professional reflection (94%), peer exchange (93%), and a sense of belonging (91%).

At the same time, students reported significant growth in inclusive design (96%), methodological awareness (95%), and digital skills (94%). The testimonies collected show how sharing work fostered mutual learning and professional collaboration.

Qualitative analysis identified four main themes: overcoming initial digital vulnerabilities, building psychological safety, developing professional collaboration, and strengthening a sense of belonging. Psychological safety emerged as a key condition for participation and sharing.

Discussion

The results confirm that the simple availability of technological tools is not sufficient to generate collaborative learning. In line with Wenger (1998), professional growth develops through participation in communities in which discussion and the shared construction of knowledge play a central role. The findings also appear consistent with the DigCompEdu framework (Redecker,2017), which interprets digital competence for teachers as a pedagogical, collaborative, and inclusive skill.

The evidence collected shows how psychological safety represents a fundamental condition for promoting participation, collaboration, and mutual learning. Consistent with Edmondson (1999), reducing the fear of judgment fostered a willingness to share and experiment professionally.
The digital affectivity described by Zembylas (2015) emerges as a central dimension of the educational experience, influencing motivation, trust, and a sense of belonging. Digital environments can transform into authentic professional communities of practice when designed as relational spaces grounded in pedagogical care, mutual recognition, and collaboration. Although the study is limited by the absence of a control group and the use of self-reported data, the convergence of participant observation, digital artifact analysis, and questionnaire findings provides meaningful insights for the design of collaborative learning environments in teacher education.
In conclusion, the study highlights how the quality of relationships is a key component of educational innovation. For initial teacher training, this requires designing digital environments capable of integrating technological skills, inclusion, participation, and the emotional dimension.

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Visual impairment and empathy: the potential of assistive technologies

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The debate on mirror neurons, which arose within paradigms strongly linked to the visual observation of action, today allows a broader reading of embodied simulation, oriented toward networks that connect movement, perception, and resonance (Rizzolatti & Sinigaglia, 2019; Bonini et al., 2022). In this scenario, visual impairment could make this theoretical opening more evident, given that access to the experience of the other occurs through a different organization of sensory experience: voice, the rhythm of interaction and haptic perception would become paths of interpersonal understanding, supporting forms of recognition that take shape in the relationship and in the sharing of experience (Ricciardi et al., 2009; Arioli et al., 2021). In line with this reading, the concept of vicariance would assume a significant value. This is because, by focusing on the capacity of living beings and of the environment to reorganize themselves through experiential pathways, replacing one process with another with the achievement of the same objective, it could open functional and alternative perspectives through which knowledge and relationship are constructed (Berthoz, 2015; Sibilio et al., 2023). Within this framework, empathy could be interpreted as an embodied and situated process, capable of articulating itself through different perceptual configurations, in which touch and hearing support the adoption of the other's point of view, making the intentional quality of action accessible. Studies related to perspective taking also help to understand this direction, showing that the change of perspective involves a bodily transformation of reference systems, not remaining only on a simple visual operation (Kessler & Thomson, 2010; Berthoz & Thirioux, 2010). This perspective opens a relevant pedagogical vision: the inclusion of students with blindness or low vision requires educational environments in which experience is designed as a multisensory process and shared reality, with mediations capable of supporting links between relationship and understanding. In this regard, assistive technologies could assume a particularly significant role, especially if conceived as instruments of embodied mediation capable of broadening experience and making it materially accessible. Technological devices such as the 3D printer, in particular, would make it possible to transform visual contents, spatial configurations and action scenes into objects that can be explored through touch, offering the student with visual impairment the possibility of constructing bodily maps of experience through manipulation and guided orientation (Di Tore et al., 2021; Holloway et al., 2025). The three-dimensional model thus becomes a relational artifact. Its function, in fact, would go beyond the mere material rendering of a form, developing as a mediation between teacher and student, through the verbal description that accompanies exploration and thanks to the possibility of sharing a common object around which attention and participation are organized. Furthermore, 3D printing could give haptic consistency to contents that, for the sighted student, are often available in their iconic form (Mukhiddinov & Kim, 2021); for the student with visual impairment, instead, the printed object would favor a more situated, progressive and bodily process, in line with the idea that the understanding of the other and of the world passes through sensorimotor schemas and forms of active exploration (Grafton, 2009; Schaefer et al., 2012). The relevance of this assistive technology would emerge precisely in the processes linked to empathy, making tangible a posture, a spatial arrangement or an element of the social scene and consequently broadening the conditions in which the student with visual impairment can access the other's perspective through a shared construction of meaning. Alongside the three-dimensional printer, software based on artificial intelligence would support the personalization of mediations, facilitating the description of images, the transformation of teaching materials and the preparation of models more consistent with the student's perceptual needs (Miao & Holmes, 2023). Their value, however, fully grows within an aware pedagogical framework, capable

of selecting and integrating technological instruments with the quality of educational interaction (Aiello et al., 2014). A platform that organizes content, or software that prepares a file for 3D printing, acquires formative meaning if integrated into an environment that promotes multisensory interaction and perspective decentering. In these directions, assistive technologies would be configured as vicarious didactic devices, through the opening of alternative pathways to experience and the valorization of perceptual plasticity, which would allow the class group to know the plurality of the ways through which the understanding of the other occurs. In light of these considerations, it would be relevant to underline that the 3D printer, integrated with software based on artificial intelligence, could foster empathic and relational processes of students with visual impairment through the activation of vicarious senses, promoting the understanding of the other through flexible and alternative strategies in an educational design aimed at the valorization of differences.

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Between Presence and Distance: New Perspectives for Students on Hybrid University Education

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In Italy, the increasing phenomena of gentrification have significantly reduced the number of university students living away from home, as the cost of long-term housing has become increasingly prohibitive (Rossi & d'Addona, 2025). In this scenario, the research question of the present work is positioned: a holistic approach, based on blended learning articulated partly in person and partly online, can reconcile the learning and social needs of students with their personal and professional requirements. To address this question, the research team conducted a qualitative study on a group of students enrolled in the master's degree program in "Coordination of Educational Services and Technologies for Inclusion" (LM-50/93).
The choice to analyse this particular course is driven by its adherence to the edunext project, a Digital Education Hub that involves 35 universities and 5 Italian institutions of Higher Artistic and Musical Education; with the stated objective of innovating higher education through digitalisation and the adoption of new teaching methodologies. In this perspective, it was decided to organise the LM-50/93 course in a blended mode through a teaching approach that involves delivering 50% of the video lessons asynchronously and 50% in person.
Methods
The study was conducted at the University of Naples Parthenope and all data were collected on May 6, 2025. The 14 students who participated in the study (five males and nine females) were divided into three heterogeneous groups: two groups of five people and one group of four people. The audio interviews were conducted by two members of the research team (FPS and AP), who were not involved in teaching the course under review.
For the data analysis, Braun and Clarke's qualitative-reflexive thematic analysis (2019) was chosen, deemed appropriate considering the diverse and subjective educational experiences under examination. Rigour was pursued through coding conducted collegially by the two researchers (FPS and AP), with systematic discussion.
Results
Theme - 1: The necessity to restructure the educational provision
The comments reveal that the students' expectations remain largely unmet, primarily due to the lack of a direct link between theory and practical application.
Theme - 2: Entry skills and compatibility between study, work, and personal life
From the comments, it emerges that working students and those with personal commitments recognise the hybrid teaching method (online/in-person) as a fundamental tool for balancing the different dimensions of their lives.
Theme - 3: Organisational and managerial issues
The collected testimonies highlight structural and organisational criticalities that affect multiple dimensions of the study program. Such issues are attributable to ambiguities in defining the professional figure targeted by the course, the scheduling of internships, as well as the imbalance in the educational workload and the disconnect between academia and the job market.
Conclusion

The course students express a clear preference for hybrid teaching over exclusively virtual modes, motivated not only by practical needs for flexibility (related to the necessity of balancing study, work, and personal life) but also by the recognition of the irreplaceable value of social interaction and experiential learning in person (Iavarone et al., 2017). This finding aligns with what has been highlighted in the international literature (Sun, 2023; Bruijn-Smolders & Prinsen, 2024) and suggests that the transition to hybrid models cannot be reduced to a mere technological or organisational issue, but requires a comprehensive pedagogical redesign that places the quality of educational relationships at its core. Furthermore, the introduction of continuous assessment processes and short teaching units (10–15 minutes) seems consistent with the needs of working students as well as with the methodologies typical of distance learning.
It should be emphasised that these results were obtained in a predominantly humanities disciplinary context, historically less explored compared to STEM disciplines in blended learning research (Bruijn-Smolders & Prinsen, 2024). From this perspective, the present study contributes to filling a gap in the literature by providing initial qualitative evidence on the adoption of blended learning in a course orientated towards pedagogy and educational sciences.

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Immersive Learning Environments for Inclusion: A Pilot Study on the Perceptions of In-service Teachers

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Educational systems are increasingly shaped by technological innovation, prompting a rethinking of learning environments. Within this context, immersive classrooms have emerged as promising Innovative Learning Environments (ILEs) supporting participation, engagement, and accessibility.. However, the educational value of these environments depends not only on technological advancements but also on teachers' ability to integrate them into inclusive educational practices. Accordingly, this study investigates in-service teachers' perceptions of immersive classrooms and their potential implications for inclusive teaching and professional development.

Research background

Research on eXtended Reality (XR) highlights its potential to support Innovative Learning Environments (ILEs) through immersive learning experiences (Radianti et al., 2020; Makransky & Petersen, 2021; Giaconi et al., 2023). However, research on immersive classrooms remains largely focused on technological design and small-scale intervention studies, with limited attention to pedagogical frameworks and teachers' perspectives, particularly in relation to inclusive education (Lorenzo et al., 2016; Creed et al., 2023a, 2023b; Dudley et al., 2023). Since teachers' competence and perceptions influence the adoption of immersive technologies (Lemon & Garvis, 2016; Joo et al., 2018; Caldarelli et al., 2023), investigating their perspectives is essential for supporting their effective pedagogical integration.

Materials & Methods

A quantitative study was conducted with 86 in-service teachers. Participants experienced the I.D.E.A. 360 immersive classroom before completing a structured questionnaire. The questionnaire was organised into four sections: (a) demographic and professional characteristics; (b) experience within the immersive classroom; (c) perceptions of immersive technologies for inclusive teaching; and (d) perceived impact on future professional development. Items were rated on a five-point Likert scale (1 = Strongly disagree; 5 = Strongly agree). Data were analysed using descriptive statistics (Siedlecki, 2020).

Results

The final sample consisted of 86 in-service teachers, the majority of whom were female (89.5%). Participants were predominantly aged between 20 and 30 years (39.5%), reported one to five years of teaching experience (69.8%), and perceived their digital competence as intermediate (67.4%). Overall, participants reported highly positive perceptions of the immersive classroom experience and its educational potential (Figure 2). The environment was perceived as engaging, professionally stimulating, and educationally valuable, while immersive classrooms were recognised as effective tools for expanding learning opportunities, promoting participation, facilitating access to educational content, and supporting personalised teaching. The strongest agreement concerned the need for specific training and technical support to enable their effective implementation. Participants also expressed positive expectations regarding the impact of immersive technologies on their professional

development and a strong interest in future training and research initiatives. However, they reported lower confidence in independently selecting immersive content for inclusive teaching. Exploratory analyses revealed only limited differences according to self-perceived digital competence and teaching experience, indicating broadly positive perceptions regardless of participants' professional profile.

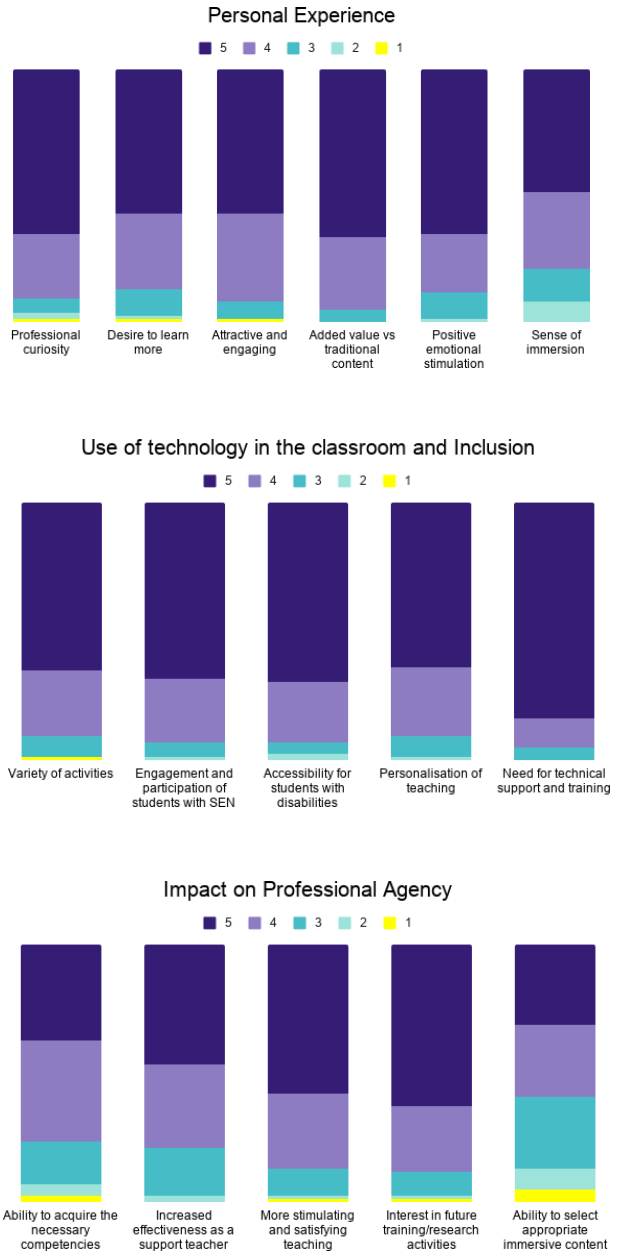


Figure 1. Questionnaire results.

Discussion

The findings indicate that in-service teachers perceive immersive classrooms as valuable resources for educational innovation and inclusive teaching. Participants recognised their potential to enhance engagement, accessibility, and personalised learning (Campos et al., 2022; Gill et al., 2024; Fugate et al., 2025). The greater variability in perceived immersion suggests

that users' experiences may also be influenced by contextual factors, including the technological configuration and organisation of activities. The strongest agreement concerned the need for technical support and targeted professional development, indicating that effective implementation depends not only on technological availability but also on teachers' pedagogical competencies (Pinnelli & Fiorucci, 2020; Caldarelli et al., 2023). Although participants expressed positive attitudes towards future use, they reported lower confidence in independently selecting and designing immersive educational activities. This suggests a gap between recognising the educational value of immersive technologies and implementing them effectively. Consistent with previous research (Meccawy, 2023; Aiello & Giaconi, 2024), these findings highlight the need for professional development focused on the pedagogical integration of immersive technologies. Limited differences across teachers suggest that readiness depends more on professional learning than on individual profiles.

Conclusions and future perspectives

This study highlights that in-service teachers perceive immersive classrooms as promising resources for fostering educational innovation and inclusive teaching. However, their effective implementation depends less on the availability of technology than on teachers' ability to integrate immersive environments into pedagogically meaningful and inclusive learning experiences (Aiello & Giaconi, 2024; Borsini & Giaconi, 2025). Participants recognised the educational potential of immersive classrooms while emphasising the need for targeted professional development. These findings suggest that future initiatives should prioritise pedagogical mediation alongside technological innovation, supporting teachers in designing accessible, engaging, and inclusive learning environments.

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Hybrid learning for inclusion and classroom well-being

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This study analyzes how through the game of bocce integrated with digital and assistive technologies it is possible to reduce communication, motor and participatory barriers, promoting processes of authentic inclusion within the class group. The theoretical basis on which the study is based derives from various theories such as embodied cognition, the Universal Design for Learning (UDL) model and cooperative learning, which highlight how, through structured and adapted interventions, the body can be a tool through which the individual constructs meaning, understands and interacts with the environment, intertwining bodily and social dimensions making possible the active participation of all students (Castro-Alonso et al., 2024). In this regard, Inclusive Physical Education plays a central role in promoting equity and participation, as it enhances movement as an accessible tool that can be adapted to different educational needs (Poupore, 2026). On the basis of these theoretical reflections, the studio designed a recreational-motor intervention in which the pupils, including those with SEN, participated in synergy in the construction of the motor path, materials and played the game of bocce with the help of technologies. In particular, a quasi-experimental design was adopted with pre-test and post-test and control group, the study lasted 12 months with two weekly meetings of 60 minutes. Two fifth classes of primary school were involved in the study, one class represents the experimental group consisting of 25 pupils, 4 of whom have SEN and the other class represents the control group consisting of 24 pupils, 3 of whom have SEN. The experimental group participated in a structured educational intervention based on the game of bocce with the integration of digital and assistive technologies, while the control group participated in the game of traditional bocce, in the absence of technological support. In particular, the intervention was structured in progressive phases by providing an initial phase of introduction to the game of bocce with the help of the IWB (Interactive Whiteboard) as a visual support for the understanding of simplified rules and the visualization of videos of the game of bocce. Subsequently, the students of the experimental group participated in the construction of the game material according to the principle of learning by making, with the support of the IWB for the vision of models and speech synthesis that supported the active participation of the students with SEN. During the educational intervention, in order to promote the inclusion of pupils with SEN, the participation and mutual collaboration of the class group, digital technologies such as the tablet for score management, the IWB as a visual support and assistive technologies such as speech synthesis and the pointer used to facilitate the choice, orientation and identification of targets were integrated. The intervention also included preparatory motor activities aimed at the development of the technical gesture of bowls and structured team play with gradual progression of difficulty; in fact, the activities passed from a guided phase to a phase of increasing autonomy. A pre-test evaluation was carried out for data collection, followed by educational intervention and a post-test evaluation, observations were also conducted during all phases of the intervention. The tools used were the following:

SDQ (Strengths and Difficulties Questionnaire)
WHO-5 Well-Being Index
Structured observation grids

Quantitative data were analyzed by t-tests for paired and independent samples, the significance level was set at $p < .05$, and the effect size was calculated with Cohen's d. Qualitative data were analyzed by systematic longitudinal observation with verification of inter-observer reliability. No significant differences between experimental and control groups emerged at the pre-test ($p > .05$), indicating the initial comparability of the groups. Therefore, the results of the SDQ show a greater improvement in the experimental group, with a reduction in difficulties ($\Delta = -5.2$ vs -0.8) and an increase in prosocial

skills ($\Delta = +2.3$). The post-test differences are significant for total difficulties, $t(47) = 2.91$, $p < .01$, $d = 0.84$, and prosocial skills, $t(47) = 2.67$, $p < .05$, $d = 0.77$. The WHO-5 also shows a more consistent increase in the experimental group ($\Delta = +19.3$ vs $+3.3$), with significant differences between groups, $t(47) = 3.12$, $p < .01$, $d = 0.90$. Qualitative observations confirm an improvement in the experimental group in participation, cooperation and inclusion, with greater evidence in pupils with SEN and good inter-observer reliability ($\kappa > .80$). Overall, the intervention is associated with superior improvements in the experimental group compared to controlling over well-being, social skills, and inclusive dynamics. The results obtained confirm the effectiveness of the integration between recreational-motor activities and digital and assistive technologies in promoting inclusion and well-being in the class group; Therefore, the data collected highlight the value of collaborative activities, tutoring and peer mediation in learning processes and how cooperative and recreational-motor activities are able to foster inclusive processes within the class group representing an effective tool to promote positive interdependence, shared responsibility and mutual peer support. Despite the results obtained, the study has several limitations such as sample size, unique context and absence of follow-up, as well as the possible novelty effect and, therefore, the study suggests the need for further research on larger samples in order to improve their generalizability. Nevertheless, the recreational-motor activity with the integration of assistive and digital technologies is an effective tool in promoting inclusion and active participation of the class group, representing a driving force to encourage the participation of pupils with SEN.

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The Algorithmic Heartbeat in Prompt Engineering: Educating for New Digital Literacies through the Prompt Battle.

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In the current media ecosystem, characterized by the pervasiveness of Generative Artificial Intelligence (GenAI), Prompt Engineering emerges not as a mere technical skill, but as a new form of digital literacy essential for critically inhabiting the "Fourth Revolution" (Floridi, 2017). This discipline, defined as the art and science of designing optimized inputs for Large Language Models (LLM), is configured as a linguistic mediation practice in which natural language serves as an interface between human intentionality and algorithmic computation (Gadesha, 2025; Baldassarre et al., 2024). The scientific contribution under review analyzes the transition from simple textual interaction to an advanced form of Prompt Literacy (Hwang et al. 2023), which integrates logical-argumentative skills, critical output evaluation capabilities, and the management of the iterative nature of the refinement process. Prompting is interpreted through the lens of Austin's speech act theory, in which the input represents the locutionary act, the user's intent the illocutionary act, and the machine's generation the perlocutionary effect, elevating the prompt to a dynamic and reflexive semiotic space (Monti, 2022). Within this framework, the Prompt Battle emerges as an innovative pedagogical device that translates the format of rap competitions into human-machine interaction, transforming the technical challenge into a laboratory activity based on learning by doing and metacognitive reflection (Schmidt & Schmieg, 2022).

The core of the action research presented here focuses on the piloting of a school-based Prompt Battle. Methodologically, the investigation adopts a qualitative-descriptive paradigm inspired by Kurt Lewin's action research model, positioning the teacher as a participant observer within a real-world educational context (Mantovani, 1998). The study was conducted in a third-grade class at a middle school in Casoria, engaging a heterogeneous group of students, including students with Special Educational Needs (SEN). Accessibility was ensured through visual aids designed according to inclusive criteria (sans serif fonts, concept maps, controlled color contrasts). The teaching approach followed the Situated Learning Episodes (EAS) structure (Rivoltella, 2021), consisting of a preparatory theoretical framing phase, an operational competition phase, and a restructuring critical debriefing phase. A relevant methodological aspect was the choice to operate in a hybrid mode: while the generation of the visual output was entrusted to the ChatGPT 4.0 model via the IWB, the formulation of the prompts by the students took place exclusively in analogue mode (pen and paper), in compliance with the ministerial provisions in force on the use of mobile devices (MIM, 2024).

The experimental activity required students to analyze a real photographic image (the schoolyard) to translate its semantic, architectural, and chromatic parameters into optimized queries. The challenge pitted two cooperative learning groups, "The Lions" and "The Knights of the Court," highlighting how playful competition can act as a powerful catalyst for engagement. Analysis of the data collected in Section 5 highlights significant pedagogical results: although students initially displayed emotional and competitive biases, oriented toward favoring their own team, subsequent guided analysis of the texts allowed them to arrive at an objective assessment based on the causal link between lexical precision and output effectiveness. The victory of the "The Lions" group was determined precisely by their superior ability in semantic transcoding and syntactic structuring, confirming that the effectiveness of prompting lies in the analytical breakdown of reality. The data from the diagnostic questionnaires also revealed an educational paradox: despite a high superficial familiarity with AI (often used for emotional support or free conversation on social media), there was a profound

terminological gap and a poor awareness of how it works (only 3 out of 13 students knew the term "prompting").
The research findings underscore the effectiveness of the Prompt Battle in promoting informed digital citizenship and mitigating systemic risks such as algorithmic bias, hallucinations, and the Dunning-Kruger effect (Cuomo et al., 2022). The affective dimension emerged as a key element: the challenge transformed feelings of "fear and surprise" in the face of technological pervasiveness into a critical and reflective attitude. Through the exercise of logical-descriptive precision, students internalized the importance of human validation, reaffirming an anthropocentric vision in which the user remains the ethical and scientific guarantor of the creative process. Despite the limitations of the small sample size and the impossibility of experimenting with the digital iterative nature of the prompt due to regulatory constraints, the project demonstrates how prompting can elevate itself to a reflective practice of a metacognitive and metalinguistic nature. Ultimately, the research validates the Prompt Battle as an effective vehicle for algorithmic pedagogy, capable of integrating technical hard skills with critical soft skills, thereby equipping learners to navigate the complexity of the "on-life" reality through a novel philosophy of artificial intelligence (Floridi, 2025).

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Hybrid and emotionally aware learning environments and digital affective literacy: a mixed-method study on well-being, engagement and inclusion in secondary schools

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Contemporary technologies are creating hybrid learning environments in which physical and digital dimensions increasingly overlap (Selwyn, 2021). Generative AI can simulate empathetic responses, making it essential to distinguish artificial support from authentic human relationships (Floridi et al., 2018; Mintz et al., 2023). These tools may support students with Specific Learning Disorders (SLDs) through personalised content, immediate feedback and less judgemental interaction (Ok et al., 2017). Their educational use, however, requires Digital Affective Literacy, understood as the ability to interpret digitally mediated emotions critically and distinguish simulated empathy from human responsibility.

Aims

The study examines how emotionally aware hybrid environments influence psychological well-being, school engagement and emotional self-regulation in upper secondary students. It also investigates differences between students with and without SLDs, perceptions of artificial empathy and the teacher's role in mediating technology-supported experiences (Mintz et al., 2023; Selwyn, 2021). The aim is to define educational models that balance innovation, inclusion, relational quality and Digital Affective Literacy (Holmes & Tuomi, 2022; Zawacki-Richter et al., 2019).

Tools

A mixed-methods approach combined quantitative measures with the exploration of students' subjective experiences (Creswell & Plano Clark, 2007; Johnson & Christensen, 2024). Quantitative data were collected before and after the intervention through the SEQ, DERS, WEMWBS and SRQ-A, assessing engagement, emotional regulation, psychological well-being and motivational autonomy (Fredricks et al., 2019; Ryan & Deci, 2020). Qualitative data came from semi-structured interviews, digital reflective journals and classroom observations and were examined through thematic analysis (Braun & Clarke, 2021).

Sample selection

The study involved 120 students aged 14–16 attending the first two years of classical and scientific high schools in Naples. Participants were equally assigned to an experimental and a control group, each including four students with dyslexia. Six humanities teachers acted as pedagogical mediators, guiding technology use and reflection on identity, emotions and artificial empathy.

Educational Intervention

Both groups studied identity, emotions, self-construction and the relationship between individuals and society through literary and philosophical texts. The control group followed traditional lessons, guided reading, discussion and individual writing. The experimental group used generative AI, educational chatbots, digital platforms, emotional diaries and storytelling tools. Teacher-led discussions supported critical reflection on simulated empathy and promoted Digital Affective Literacy.

Results

Quantitative results

The groups were comparable at pre-test. The control group showed only small, non-significant changes, whereas the experimental group recorded significant improvements in engagement (+18.6%), psychological well-being (+15.2%) and motivational self-regulation (+13.9%), alongside reduced emotional regulation difficulties (-17.4%; $p < .01$). Students with SLDs obtained even greater

benefits, with increased engagement (+21.3%), well-being (+17.8%) and self-regulation (+15.1%) and reduced emotional difficulties (-19.6%; $p < .01$).

Qualitative results

Four themes emerged: learning experience, emotional engagement, relationship with technology and inclusion. Control-group students described the activities as structured but less emotionally engaging, while students with SLDs reported cognitive load, fear of mistakes and limited participation. Experimental-group students experienced greater involvement, personalisation and freedom of expression. Multimodal tools reduced anxiety and increased autonomy, confidence and inclusion among students with SLDs. Teachers observed stronger participation, better peer relationships and a more collaborative classroom climate.

Discussion

Hybrid and emotionally aware environments improved engagement, well-being and educational quality by integrating cognitive, emotional and relational dimensions (Selwyn, 2021). Multimodal technologies supported personalised expression and more inclusive access to learning, particularly for students with SLDs (Ok et al., 2017; Rivoltella, 2020). AI facilitated reflection and emotional organisation, but students recognised that artificial empathy cannot replace human relationships, demonstrating an emerging Digital Affective Literacy (Mintz et al., 2023). Teacher mediation remained essential in transforming technology into a meaningful educational resource (Holmes & Tuomi, 2022).

Conclusion

Hybrid and emotionally aware environments can make education more accessible, inclusive and meaningful when technology is integrated into a critical, relational and human-centred pedagogical framework. Their effectiveness depends on teacher mediation, disciplinary content, multiple forms of expression and reflective use rather than on technology alone. The main limitations concern the single-school context, the small SLD subgroup, the convenience sample and the short duration. Future research should involve larger samples, longitudinal designs and different educational contexts, while strengthening teacher training in Digital Affective Literacy.

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The Irreducible Dimension: Toward an Integration of Automated Tutoring and Mentoring in AI-Supported Education

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The spread of generative artificial intelligence agents is reshaping hybrid educational environments, understood here as contexts in which students, teachers, tutors, mentors, and artificial systems interact. Chatbots, intelligent assistants, and automated tutoring systems are increasingly used to provide explanations, feedback, adaptive practice, and study support. This transformation is not merely an instrumental innovation, since it alters the distribution of educational functions, the relationship between students and knowledge, the role of the group, and adults' responsibilities in supporting learners.

This contribution offers a theoretical reflection grounded in a narrative review of the literature on Intelligent Tutoring Systems, educational mentoring, the Community of Inquiry framework, and digital wellbeing. Its aim is to clarify which functions may be delegated to AI tutoring systems, which require human responsibility, and which may be shared within a model of co-responsibility.

From early computational architectures to current systems integrated with generative language models, Intelligent Tutoring Systems can support learning through explanations, immediate feedback, monitoring, and personalisation (Cristea et al., 2025). However, speed of response and effectiveness of feedback do not necessarily correspond to depth of processing, cognitive autonomy, and meaning-making. When not adequately designed, their use may encourage cognitive offloading, dependence on the interface, reduced dialogue, and isolation from the educational community.

In this context, it is useful to distinguish between tutoring and mentoring without treating them as entirely separate categories. Tutoring primarily concerns situated support for the task and the learning process: clarifying, guiding, monitoring, correcting, proposing exercises, and facilitating self-assessment within a scaffolding approach oriented towards autonomy (Wood et al., 1976). Mentoring, by contrast, takes the form of a broader developmental relationship focused on personal growth, the recognition of individual resources, decision-making, and future planning (Kram, 1985; Crisp & Cruz, 2009; Dawson, 2014). The two functions may overlap, but they differ in their primary focus, time horizon, and degree of technological delegability.

The Community of Inquiry framework provides a useful lens through which to understand this distribution of functions. AI tutors may contribute to cognitive presence when they support exploration, connections, the integration of information, and the reworking of problems. They may also support some components of teaching presence, such as feedback, monitoring, and personalisation, without independently assuming educational and institutional responsibility. The design of the learning context, the definition of educational purposes, assessment, group management, and the development of social presence require intentional and accountable human mediation (Garrison et al., 2000).

This distinction points towards a model of co-responsibility articulated across four levels. At the operational and cognitive level, AI can provide explanations, practice activities, adaptation, and procedural support. At the metacognitive and guidance level, tutors, teachers, and mentors support self-regulation, awareness of learning strategies, and the interpretation of errors. At the relational and ethical level, human actors safeguard recognition, trust, belonging, equity, and responsibility. At the organisational level, institutions must ensure governance, quality, data protection, accessibility, and the monitoring of outcomes.

Digital wellbeing represents a cross-cutting dimension of the model. An AI-supported environment is not educational simply because it is personalised, but because it promotes autonomy, cognitive load

management, awareness of technological delegation, the quality of relationships, and the embodied dimension of learning. Evidence on youth mentoring shows moderate but significant effects when programmes are carefully designed, monitored, and sustained through stable relationships (Raposa et al., 2019). This highlights the need to involve the entire teaching staff, together with instructional designers, learning technologists, accessibility experts, developers, and students, in the design and evaluation of these systems.

The challenge, therefore, is not to oppose the human and the artificial, but to design environments in which AI supports access, personalisation, and feedback, while human actors retain responsibility for meaning, relationships, agency, and wellbeing. There is a need to develop operational frameworks and indicators capable of monitoring not only performance, but also self-regulation, dependence on the interface, sense of belonging, quality of dialogue, and students' digital wellbeing.

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The Virtual Museum as an Inclusive Learning Environment: Teachers' Perceptions of AI, Flipped Inclusion and Digital Wellbeing

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The Fourth Industrial Revolution is reshaping education through new tools, and through new cognitive, relational and affective conditions. Artificial intelligence now selects content, suggests pathways, generates responses, personalises learning and influences the relationship between learners, knowledge and educational environments. This paper examines this transformation, asking what AI can do, and how it changes the ways in which people feel, learn, participate and recognise themselves in digital spaces.

For many years, educational reflection on digital technologies focused mainly on Digital Literacy, understood as the ability to access, evaluate, produce and share information in technologically mediated contexts (Rivoltella, 2008). This is no longer enough. AI systems do not only organise information; they also affect motivation, trust, belonging, autonomy, dependence, responsibility and cooperation (Floridi, 2022). For this reason, the contribute argues for a shift from Digital Literacy to *Digital Affective Literacy*: a broader competence that includes the emotional, ethical and intersubjective dimensions of mediated educational experience (UNESCO, 2023).

The educational relevance of this shift can be read through the critique of the separation between reason and emotion (Damasio, 1994). Learning is never a purely informational process. It is shaped by affective tones, embodied experience, confidence, recognition and distance (Aiello et al., 2016). Emotions are not irrational forms, but intelligent forms of evaluation (Nussbaum, 2001). In educational contexts, this means that AI literacy cannot be limited to technical understanding. It must include the ability to recognise how algorithmic systems affect attention, motivation, agency, responsibility and relationships.

Within this framework, the virtual museum becomes a particularly significant case. It is not simply a digital copy of the physical museum (Campitiello et al., 2022). When pedagogically designed, it can become a hybrid learning environment in which cultural heritage, algorithmic mediation, accessibility and inclusion converge. The learner does not merely consult information, but explores, interprets, chooses, takes perspectives and constructs meanings. The Contextual Model of Learning helps to read this experience as the interaction between personal, socio-cultural and physical contexts (Falk & Dierking, 2000). In the virtual museum, these dimensions do not disappear; they are reconfigured through interface design, navigation, mediated presence and, increasingly, algorithmic curation.

The paper also links to the wider debate on culture, participation and wellbeing. The growing interest in social prescribing has shown that cultural activities, artistic experiences and museum visits may contribute to health, participation and quality of life. In this perspective, the virtual museum can extend access to cultural experience for people who face geographical, physical, cognitive, institutional or social barriers. However, technological availability does not automatically produce inclusion. Access must be designed.

This is where the perspective of *Flipped Inclusion* becomes central. Inclusion should not be treated as a later adaptation of a path designed for a standard learner, but as the starting point of educational design (Corona & De Giuseppe, 2017). Applied to virtual museums, this means understanding accessibility not only as technical compatibility, but as the real possibility to orient oneself, participate, understand, contribute and feel recognised within the experience. The related concept of *perspective-taking* is also important. It allows the virtual museum to be understood as a space of cognitive and affective decentring, where the learner can encounter other viewpoints and inhabit difference as a resource (Di Tore et al., 2014; Di Tore et al., 2023).

The empirical part of the study is based on a quantitative exploratory-descriptive survey involving 629 Italian teachers. The questionnaire investigated previous experience with virtual museums, self-perceived competences, digital prosociality, affective wellbeing in museum experience and attitudes towards educational AI. The aim was not to measure causal effects, but to map teachers' perceptions, orientations and training needs in relation to virtual, algorithmic and inclusive learning environments.
The results show a strong openness towards the inclusive and cooperative potential of virtual museums. Although direct experience of virtual museums is not yet widespread, most respondents consider them capable of supporting inclusive and cooperative learning. Teachers also report high levels of social and prosocial competences. Digital prosociality is expressed especially through willingness to help others overcome technological or communicative difficulties and through responsibility for a respectful online climate.
The affective dimension of the virtual museum is evaluated positively, although with different intensities across items. Motivation, curiosity, sense of belonging and collective wellbeing receive higher scores than personal recognition, mood and self-esteem. This suggests that the value of the virtual museum is perceived less as an individual benefit and more as a relational experience. Wellbeing appears to emerge from participation, cooperation and shared meaning-making.
The section on AI reveals a significant gap. Teachers attribute high importance to specific training for the responsible use of AI, while their self-perceived knowledge of AI remains more moderate. This distance between openness and critical competence recalls the educational version of the "Frankenstein Complex": not a simple fear of technology, but an ambivalent trust, in which the potential of AI is recognised while the capacity to govern it critically is still developing. The notion of AI literacy is useful here, as it distinguishes the simple recognition of AI from the ability to understand, use and critically evaluate intelligent systems (Long & Magerko, 2020). The findings also echo current research and policy concerns, which stress that AI in education must be governed through human-centred, ethical and pedagogically grounded frameworks (Zawacki-Richter et al., 2019; Holmes et al., 2019; UNESCO, 2023).
The main pedagogical implication is clear. Training teachers in AI does not mean simply teaching them to use intelligent tools. It means preparing them to design educational environments in which technology, relation and inclusion support each other. AI may help to personalise pathways, translate content, adapt materials and support access. Yet it cannot replace pedagogical intentionality. Without a clear educational framework, personalisation may become individualisation without relation, and efficiency may obscure care, time and shared understanding (Brandão et al., 2024).
The virtual museum therefore becomes a privileged laboratory for observing the educational challenges of the Fourth Industrial Revolution. It shows that the future of digital education depends not only on technological innovation, but on the capacity to build environments where accessibility, algorithmic responsibility and human relation remain inseparable. The algorithmic heartbeat of contemporary education does not yet sound in unison. The task of pedagogy is to help tune it to a more inclusive, critical and humane rhythm.

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Digital spaces and augmentative and alternative communication (aac). Towards emotionally aware inclusive digital learning spaces.

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The evolution of digital technologies has transformed learning environments into hybrid ecosystems where physical and virtual dimensions integrate seamlessly (Dede, 2010; Bonk & Graham, 2012; Luckin, 2018). In these contexts, communication is central to social relationships, active participation, and individual well-being. According to Vygotsky's (1978) sociocultural perspective, effective communication is an essential condition for inclusion; when limited, the risk of isolation and reduced Learning opportunities increases. Augmentative and Alternative Communication (AAC) offers strategies and tools to support or replace verbal language in individuals with complex communication needs (Beukelman & Light, 2020). Today, integrating AAC into digital spaces draws attention to the emotional dimension. Educational research is shifting toward Emotionally Aware Learning Environments, which recognize and support students' affect through intelligent technologies (Picard, 1997; D'Mello, 2013). Despite these developments, dialogue between AAC and emotionally aware digital design remains limited. This paper explores their convergence to promote accessibility and well-being.

Digital transformation has fostered flexible ecosystems where experiences develop across physical and virtual spaces. Hybrid environments enable the simultaneous participation of both co-located and remote students, expanding personalized learning (See, Daniel, Koh, 2026). Within these ecosystems, emotional factors like motivation and anxiety profoundly influence engagement.

Drawing on affective computing (Picard, 1997), Emotionally Aware Learning Environments employ interaction data, sensors, and AI to monitor engagement and potential emotional difficulties. Their goal is to support instructional adaptation, though they raise critical ethical and privacy concerns. However, inclusion is not an automatic consequence of innovation. Digital tools do not inherently guarantee the removal of barriers. A design-oriented perspective must view technology as part of a broader educational ecosystem, where AAC functions as an inclusive practice recognizing communicative diversity.

AAC represents a comprehensive approach that treats communication as a fundamental human right (Light & McNaughton, 2014). Communicative effectiveness depends on the interaction of linguistic, operational, social, and strategic competencies (Light, 1989), promoting active engagement and personal autonomy in schools (Mirenda, 2014).

AAC systems include unaided methods (gestures, expressions) and aided solutions. Aided tools range from low-tech supports (communication boards using graphic symbol systems like ARASAAC or Widgit) to high-tech digital devices (speech-generating devices and dedicated mobile applications). Mobile technologies have made AAC flexible and highly integrated into everyday activities (Beukelman & Light, 2020). Beyond functional access, the ability to express choices and emotions via AAC increases self-efficacy and a sense of belonging, serving as a prerequisite for meaningful participation within emotionally aware contexts.

In line with Universal Design for Learning (UDL) principles, digital platforms offer significant opportunities for integrating AAC through multimodal interfaces combining text, symbols, and audio supports, thereby reducing cognitive load (CAST, 2018; Meyer et al., 2014). Collaborative environments turn digital interactions into a shared social practice, transforming online spaces into genuine communities of practice (Wenger, 1998).

The integration of Artificial Intelligence (AI) makes AAC tools increasingly adaptive (Zdravkova et al., 2022). Key examples include GoVisual, which uses computer vision for visual storytelling (Tintarev et al., 2016), and HearMeOut, combining pictogram systems with gesture-driven predictive

text (Srivastava, 2021; Li et al., 2022). Breakthroughs also encompass Speech-to-Text technologies (Seebun & Nagowah, 2020), sign language translation systems utilizing neural networks (CNNs/RNNs), and sensor-equipped smart communication gloves (Ozioko & Dahiya, 2022).
However, critical issues remain: algorithms can introduce interpretative biases or standardize expression. Automated emotion-recognition systems pose a high risk of misinterpretation for students with motor or neurological disabilities, whose expressive modalities differ from the data used to train algorithmic models. Therefore, AI-enhanced AAC demands a strictly human-centered approach.
Designing inclusive digital environments requires a systemic vision. Applying Wayfinding Theory—originally explaining physical navigation (Passini, 1984)—to digital spaces reveals a multidimensional orientation structure encompassing cognitive, communicative, social, and emotional dimensions. Here, AAC acts as a communicative wayfinding infrastructure that makes hybrid learning environments predictable and participatory. On this basis, we propose the concept of the Emotionally Aware Inclusive Digital Learning Space (EAIDLS), structured around three fundamental axes:
- Adaptive Accessibility: Differentiated pathways ensuring access to educational content.
- Collaborative and Shared Communication: Moving AAC from a purely compensatory tool to a shared practice for the whole classroom.
- Emotional Awareness: Prioritizing the central role of affect and emotional safety (Banda et al., 2026) in digital learning.
AI functions as the assistive infrastructure connecting these axes. While technologies can monitor distress, AAC serves as the essential mediating layer that allows students to actively express and communicate their inner emotional states. Looking forward, the IN+ Principles of Meaningful Digital Inclusion (INCLUDE+ Network) offer a design roadmap through six core pillars: a holistic approach to power dynamics, sustainability of educational practices, celebration of communicative diversity, responsiveness via continuous AI personalization, collective care for well-being, and meaningful, co-designed digital experiences.
To conclude, the hybrid transformation of educational spaces is a profound pedagogical shift. Building an EAIDLS requires looking beyond basic digital access to foster genuine, substantial inclusion. By integrating AAC and artificial intelligence under the guidance of human-centered, inclusive design, the technological environment ceases to be a barrier and becomes an empowering resource. The ultimate goal is to guarantee that every learner, regardless of their specific communicative needs, retains the fundamental right to navigate, express their emotions, and participate authentically in the co-construction of knowledge.

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Pedagogy and teaching in emergency contexts in the age Of artificial intelligence: towards a human-centred Framework for educational continuity, inclusion and Resilience

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The contemporary global educational landscape is increasingly vulnerable to systemic crises, including natural disasters, public health emergencies, armed conflicts, and socioeconomic instability. These events do not merely interrupt educational continuity; they exacerbate existing social, economic, and geographic inequalities, disproportionately affecting vulnerable populations (Burde et al., 2017). In this context, Education in Emergencies (EiE) must be understood not only as a temporary humanitarian response, but as a structural and pedagogical imperative for safeguarding the universal right to education. Educational resilience therefore requires a shift from reactive and fragmented models toward proactive and adaptive systems capable of anticipating, absorbing, and recovering from crises without compromising the quality and equity of teaching and learning.

This resilience cannot be achieved without integrating the psychological, emotional, and relational dimensions of education. Trauma-informed education highlights how large-scale crises can profoundly affect students, families, and teachers, altering stress regulation and compromising cognitive, executive, and socio-relational functioning essential to learning (Avery et al., 2021; Berger, 2024). Effective educational intervention in emergency contexts must therefore ensure physical and emotional safety, accessibility, methodological flexibility, predictable learning routines, community participation, and sustained socio-emotional support.

Within this framework, Artificial Intelligence (AI) emerges as a potentially transformative but inherently ambivalent resource. The experience of emergency remote teaching demonstrated both the opportunities and limitations of digital technologies in maintaining educational continuity (Bond et al., 2021). AI can strengthen emergency education through early-warning systems, adaptive tutoring, accessible content generation, automated translation, and decision-support tools. Predictive systems can identify patterns of disengagement and enable educators to intervene at an early stage, while intelligent tutoring systems can adapt learning activities to students' needs when continuous teacher presence is limited by logistical, health, or security constraints. Generative AI and natural language processing can facilitate the rapid production of simplified, multilingual, and multimodal educational materials, helping to reduce linguistic and accessibility barriers affecting displaced students, refugees, and learners with disabilities. At the institutional level, AI-supported decision systems can assist policymakers and educational organizations in modelling crisis scenarios and allocating scarce educational resources.

Nevertheless, the uncritical adoption of AI may reproduce or intensify precisely those inequalities that emergency pedagogy seeks to reduce (Bond et al., 2024). Algorithmic bias can generate inaccurate assessments or discriminatory classifications when systems rely on datasets that inadequately represent linguistic minorities, disadvantaged communities, or other vulnerable groups. At the same time, extensive digital surveillance, the collection and reuse of sensitive educational data, and opaque algorithmic profiling raise serious concerns regarding privacy, autonomy, and fundamental rights, particularly when minors are involved. Algorithmic opacity may also prevent educators, families, and institutions from understanding or contesting automated decisions, weakening trust in educational systems.

Another critical issue concerns the digital divide. AI solutions dependent on continuous connectivity, electricity, advanced devices, or cloud infrastructures may exclude rural, low-income, displaced, and humanitarian communities. Technological dependence can consequently transform a temporary emergency into a persistent educational disadvantage. Furthermore, excessive

automation risks weakening the human and relational dimension of education by reducing opportunities for empathy, emotional co-regulation, and pedagogical care.

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Topic 5

Digital Affective Literacy and Citizenship

Thinking Routines and new Italian Guidelines 2026.

Ambretti Antinea

The Italian educational and institutional landscape is currently undergoing a period of profound epistemological and structural reconfiguration, initiated by the enactment of Ministerial Decree No. 221 of December 9, 2025. This crucial regulatory act officially adopts the New National Guidelines for Nursery and the Primary School , rendering previous legislative texts obsolete and establishing a mandatory operational timeline starting from the 2026/2027 academic year. The driving force behind this institutional reform stems from the urgent necessity to realign classroom instruction with the massive social, technological, and anthropological transformations of the twenty-first century. Moving decisively away from fragmented, encyclopedia-style content accumulation, the Ministry of Education and Merit (MIM) mandates a curriculum centered on transversal competencies, deep interdisciplinary connections, and systemic methodological innovation.

Within this updated framework, schools and curriculum designers face the immense challenge of translating broad institutional directives into daily, measurable, and impactful classroom practices. Traditional, teacher-centered transmissive lectures—focused heavily on the rote memorization of passive data—are entirely inadequate for fulfilling the complex requirements of D.M. 221/2025. Consequently, there is an urgent need for robust, evidence-based pedagogical mechanisms. Thinking Routines, developed within the "Visible Thinking" theoretical framework by the Project Zero (PZ) research center at the Harvard Graduate School of Education, emerge as an exceptionally valid and immediately applicable solution. These tools serve as the ideal operational bridge connecting the national educational policy with active learning environments across kindergarten, primary, and lower secondary levels.

The Project Zero Theoretical Framework

Grounded in the foundational literature of Visible Thinking (Ritchhart, Church, & Morrison, 2011), Thinking Routines are not superficial classroom activities ,they function as stable, flexible, and highly repeatable micro-logical structures. Their primary goal is to externalize and document students' internal thought processes, making their cognitive paths visible to both the instructor and the learners themselves. In a contemporary media ecosystem defined by hyper-stimulation and highly fragmented digital consumption, these routines introduce a deliberate and salutary deceleration of the cognitive impulse. They offer a structured scaffolding that guides students to slow down, analyze underlying phenomena, build evidence-based arguments, and continuously monitor their own intellectual journeys.

The systematic implementation of these structures fosters authentic "habits of mind." When thinking is rendered visible through collaborative graphic organizers, structured dialogues, or collective annotation walls, students do not merely learn specific disciplinary content; they actively learn how they learn. This approach promotes the internalization of higher-order metacognitive skills. Learners acquire the ability to separate objective empirical observations from subjective interpretations, tolerate the ambiguity of doubt, and restructure their prior misconceptions in light of new evidence. This critical cognitive posture directly addresses the explicit demand of the 2026 Guidelines to cultivate autonomous, strategic, and self-reflective individuals capable of navigating modern complexity.

Methodological Innovation: STEM, Computational Thinking, and Critical AI Integration

A highly significant innovation introduced by the 2026/2027 curriculum guidelines is the structural integration of informatics, computational thinking, and the ethical understanding of Artificial Intelligence starting as early as kindergarten and primary school. The ministerial mandate explicitly clarifies that the pedagogical goal is not merely technical training or tool proficiency. Rather, it focuses on fostering a rigorous, analytical intellectual stance toward digital technology.

In this context, specific exploration routines from the Project Zero framework, such as Parts, Purposes, Complexities, act as powerful analytical lenses. Faced with a natural phenomenon, a line of code, a recommendation algorithm, or a complex data visualization, students are guided to dissect the object of study. They identify its individual components (Parts), investigate their functional role within the broader system (Purposes), and critically evaluate the underlying interdependencies and potential side effects (Complexities). Consequently, the digital world is demystified. It ceases to be an unexamined, magical "black box" and is recontextualized as a space for rational, constructivist, and inquiry-based exploration, cementing the blend of scientific and civic literacy championed by the new directives.

Equitable Environments and Formative Assessment: Bridging Inclusion and Process Evaluation

Contemporary Italian classrooms are characterized by high levels of heterogeneity, featuring diverse multicultural backgrounds, plurilinguistic dynamics, and students with Special Educational Needs (SEN) or Specific Learning Disorders (SLD). The New National Guidelines strongly reaffirm the absolute centrality of inclusive education, requiring schools to proactively dismantle barriers to learning while maximizing the unique potential of every individual learner (D.M. 221/2025). From an equity perspective, Harvard Project Zero's Thinking Routines possess a deeply democratic and leveling value. Furthermore, the heavy reliance on visual scaffolding and graphic organizers ensures active participation even in low-proficiency or non-native language contexts, turning classroom diversity into a powerful resource for collective inquiry and cooperative problem-solving. This inclusive framework intersects seamlessly with the mandates of D.M. 221/2025 within the realm of assessment, as the 2026 Guidelines explicitly urge schools to move away from purely bureaucratic, summative grading aimed solely at certifying final products, promoting instead a culture of formative, orienting, and process-based evaluation capable of mapping real conceptual growth over time. This externalized thought trail offers immediate diagnostic data to adjust daily lesson planning, pinpoint student misconceptions, and calibrate subsequent interventions, while concurrently empowering students to engage in meaningful self-assessment, shifting their motivational focus from extrinsic grades to the intrinsic value of cognitive discovery and personal growth.

Conclusion

The implementation of the New National Curriculum Guidelines for the 2026/2027 academic year represents a historic opportunity to revitalize the methodological identity of the first cycle of Italian education. For these regulatory decrees to transcend mere bureaucratic compliance, teachers must be equipped with rigorous, scientifically validated pedagogical tools. The systematic adoption of Harvard Project Zero's Thinking Routines provides precisely this critical operational lever. By structuring environments centered on critical thinking, collaboration, and metacognition, these routines transform abstract national macro-objectives into a vibrant daily reality, preparing the reflective, inclusive citizens that the future urgently demands.

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Inhabiting the Algorithmic Pulse:
Affective Digital Literacy and Critical Citizenship in the Era of the Fourth Revolution

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In the age of the Fourth Revolution, understood not only as the convergence of cyber-physical systems and artificial intelligence but also as a mutation of human self-understanding, the sharp distinction between online and offline dissolves into a constitutively hybrid "onlife" condition. Digital environments do not merely transmit information: they orchestrate emotional states, modulate attention and construct reputational identities, acting upon a subjectivity solicited from within rather than repressed from without. Setting out from Asimov's short story *Evidence* and the figure of the "maimed master", the essay locates the true terrain of the educational challenge not in computational power but in empathy and affectivity. The risk is not that machines will become human, but that humanity will grow accustomed to a synthetic affectivity, devoid of the weight of the body and of the responsibility inherent in relationship.

On this premise the essay proposes Affective Digital Literacy (ADL) as a cornerstone of education for democratic citizenship: the capacity to recognise, understand, regulate and narrate the emotions that arise in interactions mediated by digital systems, together with the critical capacity to decode the technical, economic and rhetorical devices that elicit and exploit those emotions. ADL lies at the intersection of three traditions, socio-emotional education, critical media education and the ethics of artificial intelligence, and does not replace consolidated competence frameworks (DigComp 2.2) but makes explicit the affective and relational dimension they presuppose. It redefines the very idea of competence: it is not enough to know how to use or to criticise in the abstract; one must "feel critically", in a form of embodied critical thinking that interweaves reason and feeling.

The research question is: how ADL can develop critical thinking and emotional awareness in relation to algorithmic manipulation in social media and generative AI systems, while supporting a critical algorithmic citizenship grounded in body, relationship and responsibility? The method is theoretical-hermeneutic: it does not validate a model empirically but constructs a framework testable through the internal coherence of the argument, the traceability of its categories to the sources, and the transferability of its didactic implications.

The analysis describes four devices of manipulation, profiling and surveillance capitalism, attention capture and intermittent reinforcement, polarisation and architectures of reactivity, and the conversational affectivity of generative AI, which operate below the threshold of full reflective awareness, acting on rapid and emotional processes. To make the invisible visible and to restore to the subject a margin of suspension between stimulus and response is the heart of ADL applied to the critique of devices. In the school context, generative AI also raises unprecedented questions of authenticity and process: since the value of the exercise no longer resides in the product but in the cognitive and emotional process it activates, the challenge is not to prohibit the tools but to rethink tasks, so that the tool becomes a cognitive partner rather than an oracle.

The foundation is offered by the neuroscience of embodiment: mirror neurons and embodied simulation show that understanding the other is rooted in a shared corporeality, irreducible to interaction with systems that possess neither a body nor lived experience. The perspective of embodied education and the notion of simplexity (Berthoz) frame didactic action as the creative management of complexity. From this follows the distinction between embodied and synthetic affectivity: not the degree of sophistication of the behaviour displayed, but the presence of something

at stake, the body that can be wounded, the time that does not return, the responsibility that binds, marks the insuperable limit of simulated care. The teacher is not replaced but repositioned: from the transfer of information to the witness of a fragile and responsible humanity, irreducible to code.
On the operational plane, ADL is articulated along three axes: educational robotics and critical tinkering, which demystify the opacity of the machine; relational ethics, which places care at the centre of mediated responsibilities; and emotionally aware environments, which safeguard attention, time and the quality of relationship. On the didactic side this calls for curricular integration rather than a new discipline, the centrality of experience and authentic assessment. The three axes converge in a critical algorithmic citizenship, the integration of cognitive, ethical and emotional planes in a subject able to understand, evaluate and influence the systems that structure the public sphere. Far from opposing the human and the artificial, and beyond the opposite temptations of technocentrism and defensive nostalgia, ADL proposes a third way between reactionary refusal and uncritical enthusiasm: learning to inhabit the algorithmic beat as free women and men.

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Affective digital literacy and citizenship a quasi-experimental study in primary school

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The "onlife condition" (floridi, 2015) redefines cognitive and affective practices from childhood. Algorithmic systems amplify emotionally relevant content to maximize engagement (pariser, 2011; zuboff, 2019), exploiting the developmental window in which the limbic system precedes prefrontal maturation (crone & dahl, 2012). The curricular implementation of critical media education remains fragmented and pays little attention to the affective-relational dimension, especially in primary school (buckingham, 2019; ranieri, 2024). The proposed construct integrates: critical media education (masterman, buckingham), sel (goleman, casel), and research on emotion and digital cognition. The five sel skills are broken down into objectives situated in the digital context, with reference to cognitive-affective agency (bandura, 2009). However, the field remains empirically poorly consolidated in this age group, making the production of new empirical evidence urgent.

Method

Participants. 96 students (47 female, 49 male) from four classes (two fourth-grade, two fifth-grade), primary school in the province of naples. Gs: n = 48, m age = 9.8 years (sd = 0.71); gc: n = 48, m age = 9.9 years (sd = 0.68). Pretest equivalence confirmed ($p > .30$). Informed consent obtained from all parents.

Instruments. (a) dcts-c: 18 items on three subscales (algorithmic selection, source evaluation, persuasive strategies; α between .69 and .73); (b) deaq: 15-item likert scale on digital emotional awareness ($\alpha = .71–.76$), developed ad hoc with qualitative validation and piloting; (c) amrt: performance task with 10 algorithmic scenarios, 3 questions per scenario ($\alpha = .78$; $r = .51$ with dcts-c).

Intervention. Four modules over 24 hours over 12 weeks: m1 – online emotions; m2 – algorithm functioning (filter bubbles, recommendations); m3 – digital emotional persuasion (scarcity, fomo, clickbait); m4 – active digital citizenship. Teachers trained for 6 hours; fidelity check via structured observation (91% adherence). Gc with traditional teaching. Surveys at t0, t1, and t2 (3-month follow-up; n = 78).

Analysis. Ancova with pretest as a covariate; η^2p and cohen's d. Moderation analysis via hierarchical regression (spss 28.0; $\alpha = .05$).

Results

Pre-→post-test in the gs: dcts-c m = 8.62 → 11.84; deaq m = 36.14 → 42.58; amrt m = 14.23 → 18.46. Gc stable. At follow-up, modest regression in the gs, but still significant advantage. Ancova: $\eta^2p = .16$ (dcts-c), .12 (deaq), .11 (amrt); d between .43 and .67. No significant interactions with gender, ses, or home access to technology ($p > .10$). Qualitatively, approximately 25% of students have difficulty distinguishing algorithmic manipulation from human intentionality, consistent with animistic-intentional thinking at school age (piaget, 1929).

Discussion and limitations

The effect on the dcts-c (d = 0.67) and deaq (d = 0.54) is in the mid-range of comparable sel and media literacy interventions. The smaller effect on the amrt (d = 0.43) reflects the limitations of cognitive development: algorithmic understanding remains phenomenological, not mechanistic. The statistical independence between cognitive and affective improvements ($r = .19$, $p = .08$), consistent with dual-process models (kahneman, 2011), indicates the need for explicit integration into future curricula. Limitations: small sample from a single institution with a pre-existing innovative culture; no randomization; deaq without external validation; possible hawthorne effect; limited

socioeconomic variability, which may have attenuated the moderation effects (ragnedda & ruiu, 2020).

Conclusion

Digital affective literacy is a concrete pedagogical resource, but it cannot replace systemic interventions (platform regulation, nationwide teacher training, family involvement). Primary schools can build solid critical and emotional foundations, provided that the promises remain commensurate: algorithmic understanding is only partially accessible to 9- to 11-year-olds. Future research will need to employ larger samples, rigorous designs, fully validated instruments, and sequential multi-year curricula.

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Beyond the Digital Divide: AI as Linguistic and Affective Mediation Tool among Migrant Students

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This contribution presents an exploratory case study examining how adult migrant learners enrolled at the Provincial Centre for Adult Education called "Alessandro Leogrande", (CPIA 1 of Bari, Italy), perceive artificial intelligence tools in relation to linguistic mediation, educational inclusion, and affective well-being. The study is situated within the broader theoretical debate on the digital divide and its intersections with multicultural education, and draws on an original empirical dataset collected through a structured questionnaire administered to a convenience sample of 17 students with migrant backgrounds enrolled in a second-chance educational institution.

The theoretical framework is organized around three interconnected areas. The first concerns the evolution of the concept of digital divide, which has progressively shifted from a narrow focus on access to devices and connectivity toward a broader understanding of digital inequality encompassing skills, quality of use, and opportunities for meaningful participation in digitally mediated learning environments (Macevičiūtė & Wilson, 2018; Gottschalk & Weise, 2023). For students with migrant backgrounds, these layered inequalities intersect with socio-economic disadvantages, linguistic barriers, and limited familiarity with institutional systems, compounding their educational vulnerability (Akinlar et al., 2023; Buonomo et al., 2026). The second area examines the potential of AI-based tools, including machine translation systems, multilingual applications, and generative AI, as resources for linguistic mediation in multicultural classrooms (AlAfnan, 2025). These technologies may function as bridges between languages and facilitate access to educational content, though significant limitations persist in terms of contextual accuracy, cultural nuance, and the risk of reducing opportunities for active learning (Shahmerdanova, 2025). The third area addresses the socio-emotional dimension of AI use in educational settings, exploring how improved linguistic accessibility may contribute not only to comprehension but also to students' communicative confidence, classroom engagement, and perceived sense of belonging within the learning community (AlAfnan, 2025). The empirical component employs a Likert-scale questionnaire organized into five thematic sections covering perception of the digital divide, attitudes toward AI, linguistic mediation, educational inclusion, and affective well-being. The instrument was administered in Italian, English and French to respect the linguistic plurality of the target population. Data were analyzed through descriptive statistics, consistent with the exploratory design and small sample size (Etikan, Musa, & Alkassim, 2016; van de Schoot & Miočević, 2020). The findings reveal a coherent pattern: participants perceive AI primarily as a resource for linguistic support, with the highest agreement on items related to comprehending texts in a non-native language and facilitating communication among multicultural peers. Crucially, items addressing emotional dimensions, such as feeling more secure in one's studies and more included in the class group, similarly attracted substantial agreement. This convergence positions AI-mediated linguistic support as simultaneously a form of affective mediation, contributing to a sense of belonging and psychological safety within multicultural learning environments. Perceptions of the digital divide as a structural school-level problem were less pronounced, possibly reflecting the near-universal smartphone ownership in the sample. These results invite further investigation through longitudinal and comparative designs.

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Socio-Emotional and Affective Education in the Age of AI

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Among Artificial Intelligence (AI) systems, Large Language Models (LLMs) represent a distinct case compared to the digital tools that preceded them. Their ability to generate contextually appropriate and affectively calibrated responses creates a concerning effect of pseudo-empathy (Turkle, 2011). Recent data indicate that this phenomenon has already become structural: 41.8% of Italian adolescents report having turned to AI systems during moments of sadness, loneliness, or anxiety (Save the Children, 2025).

What LLMs produce is not empathy but statistical optimization (Bender et al., 2021); nevertheless, their outputs satisfy all the formal conditions of authentic listening, creating a perceptually convincing illusion of intersubjectivity. The resonance mechanisms underlying this illusion are automatic and pre-reflective (Rizzolatti & Sinigaglia, 2006; Gallese, 2026; Nass & Reeves, 1996), and simply knowing that one is interacting with a machine does not deactivate these processes (Epley, Waytz, & Cacioppo, 2007). Consequently, the distinction between functional interaction and authentic relationship is not perceptually self-evident but must be developed through sustained reflective work (Floridi, 2025; Mazzarella, 2026; Mezirow, 1991).

Against this background, the present study addresses the following research questions:

RQ1) To what extent does interaction with an LLM influence preservice teachers' perceptions by generating an illusion of intersubjectivity?

RQ2) To what extent are preservice teachers able to recognize the distinction between functional interaction and authentic relationship?

The study is designed as an exploratory investigation conducted within the Laboratory of Performative Didactic Dramaturgy (Primary Education Sciences, University of Suor Orsola Benincasa), with 158 participants, predominantly female. In the first session, participants completed a PRE questionnaire (28 Likert-scale items), interacted with ChatGPT or Gemini for twenty minutes starting from an emotionally charged statement, and then completed a POST questionnaire (17 items). In the second session, they carried out a guided analysis of the conversation using a five-indicator protocol: politeness markers, intimate self-disclosure, attribution of agency, affective punctuation, and cognitive-emotional resonance. Theatrical practices provided the framework for both sessions. At the end, individual metacognitive reflections were collected. Quantitative analysis was conducted using JAMOVI 2.7; qualitative analysis followed thematic analysis (Braun & Clarke, 2006).

Before the interaction, participants showed skepticism toward AI as an emotional interlocutor (emotion understanding: M=2.06; SD=0.95; empathic responses: M=2.41; SD=1.16). 77.7% considered it important to distinguish between authentic and simulated empathy (M=4.28), a form of awareness directed toward “others” rather than themselves.

After the twenty-minute experiment, significant shifts emerged: emotion understanding increased from M=2.06 to M=2.33 (Welch’s t=2.515, p=.012, d=0.264); empathic responses from M=2.41 to M=2.65 (t=2.019, p=.044, d=0.212). 85.1% reported feeling at least partially understood, and 56% felt comfortable, while only 26.2% reported emotional engagement.

Self-analysis revealed systematic anthropomorphizing behaviors such as emotional resonance (M=3.56), intimate self-disclosure (M=3.72), attribution of agency (M=1.85), and politeness markers

(M=1.13). In 39.9% of cases, the perceived "humanness" of the AI exceeded its perception as "fiction."
The thematic analysis of metacognitive reflections identified four themes: recognition of simulation with persistence of the effect; instrumental openness with relational reservation; concern about others' vulnerability; and opacity of the functional/authentic distinction.
The latter directly addresses *RQ2*:*"throughout the entire conversation I was always fully aware that I was interacting with a system; however, I realized that many of my responses were those I would have given to a real person".*
The findings of this study confirm that the illusion of intersubjectivity operates at a pre-reflective level and persists despite critical awareness. Preservice teachers show unexpected perceptual shifts and relational behaviors toward the machine that are only recognized retrospectively. The Laboratory of Performative Didactic Dramaturgy, by juxtaposing the pseudo-presence of AI with the embodied presence of theatre, represents an example of a device for developing digital affective literacy in future teachers (Carlomagno, Vadalà & Ricciardi, 2026). The limitations of the study (absence of a control group, predominantly female and geographically concentrated sample, and a non-psychometrically validated self-analysis protocol) open the way to future replications using standardized instruments and more heterogeneous samples, including in-service teachers.

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When Algorithms Learn to Speak: Debate as Affective Education in the Age of Artificial Intelligence

Carnevale Rosa

Conversational systems based on Large Language Models now produce coherent arguments, adapt their tone to the interlocutor and generate responses perceived as empathic with increasing effectiveness. Recent research shows that GPT-4 reaches high levels of conversational persuasiveness, especially when it has information about the listener's profile, and that the responses of language models are judged more empathic than those of professionals in certain standardised scenarios, even though they imply no real emotional experience. The result is a form of statistical empathy: a faithful replica of the outward forms of feeling which, in certain contexts, becomes difficult to distinguish from the original.

This poses a precise problem for schools. The traditional equivalence between the quality of linguistic production and the maturation of thought no longer holds if that quality can be generated artificially. The risk is not only that students delegate writing to an algorithm, but that they stop going through the effort of formulating, dissenting and responding in the first person: the very effort through which thought takes shape.

The literature points to two specific risks that overlap. The first is cognitive offloading: the tendency to transfer to AI not merely routine operations, but high-level processes such as constructing an argument or taking a position on a controversial issue. The second is linguistic standardization: when many students use the same systems to write and argue, styles and argumentative structures converge towards average forms, correct but lacking a personal voice. When cognitive delegation also becomes affective delegation, that is, when the machine is asked to find the right tone or to manage disagreement, the foundations of democratic education are silently eroded.

The response: Debate as affective digital literacy

Debate is not proposed as an antidote to AI, but as an educational practice that becomes more intelligible and more urgent precisely in relation to what artificial systems cannot do. An algorithm can construct relevant arguments, but it does not answer for those arguments before a real interlocutor who is waiting. It does not go through the vulnerability of confrontation, it does not manage the emotional pressure of dissent, and it does not distinguish the person from the argument being defended.

By contrast, Debate structures exactly these passages. In the classroom of regulated debate, conflict is not a clash to be avoided, but a condition for learning: research shows that students reason more deeply when they are exposed to divergent perspectives and are required to engage with that tension rather than bypass it. The crucial passage is the move from dialogue to metadialogue: not only exchanging content, but reflecting on how one is dialoguing, making visible the strategies used, the emotions that orient argumentative choices, and the implicit assumptions that guide reasoning. Within this framework, emotions are not noise that disturbs thought; they are a constitutive part of it. Tension, uncertainty, frustration and satisfaction are dimensions of learning that no artificial system truly goes through.

Implication and concluding prospective

At the didactic level, this leads to several concrete consequences. The assessment rubric for Debate must include, alongside the traditional argumentative and communicative dimensions, an affective-relational dimension (listening, emotional regulation, recognition of the interlocutor as a person distinct from the argument) and a metacognitive dimension (the ability

to reflect on one's own process and to distinguish personal elaboration from an output accepted uncritically). The teacher's role is redefined as a form of mediation that is both affective and digital. The inclusive design of Debate, with differentiated roles and gradual exposure, makes it a space accessible even to those who are not accustomed to public speaking. More deeply, education in democratic speech, understood as the ability to argue in public and listen to dissent, becomes a citizenship competence in an age in which persuasive messages on a large scale can be generated in a few seconds.

The concluding thesis of the contribution is both descriptive and normative: the more algorithms learn to speak, the more schools have the task of teaching students to inhabit speech, not only to produce it. The time needed to find the right words, the body that feels the pressure of the moment, the voice that carries a story, the responsibility of answering in the first person: these are dimensions that cannot be transmitted through explanation alone. They are built through repeated, reflected and relationally situated experience. And this is exactly the experience that Debate, when designed with pedagogical intention, can offer.

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Resisting the Algorithm: Affective Literacy as a Relational Compass

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Contemporaneity, mirrored in Spike Jonze's film Her, interrogates the foundational categories of human relationships: intimacy, presence, and recognition. This scenario is embedded within the transition from a linear modernity to a "liquid" postmodernity (Bauman, 2003; Giddens, 1991), which is characterized by an existential provisionality where identity is constructed through the discontinuous juxtaposition of fragments.

As highlighted by Turkle (2015), screen-mediated interaction offers an illusion of control that expels the corporeal vulnerability typical of spontaneous conversation. The flight from real time and reflective solitude reduces alterity to a reservoir for validation and a dispenser of immediate feedback. This process consolidates the anthropological figure of homo digitalis (Han, 2014; Harari, 2017), whose onlife experience (Floridi, 2017) configures itself as an apparatus for anesthetizing the trauma of the intersubjective encounter.

Algorithmic governance and the metamorphosis of control

The crisis of the individual merges with a broader post-democratic crisis. Deleuze (1990) captured the transition from Foucaultian disciplinary societies, based on physical confinement, to societies of control, wherein power operates in a diffuse and invisible manner. In late modernity, this regime is formalized as "surveillance capitalism" (Zuboff, 2019): the digital environment datafies human experience, extracting an authentic behavioral surplus from emotional and relational traces to convert it into commercial prediction products

The algorithmic apparatus acts, according to Agamben's (2006) logic, as a mechanism for uncoupling the self, generating a manipulable digital instance and commodifying intimacy. To this economic abstraction is joined the convergence between code and the sacred highlighted by Bovalino (2024): the algorithm assumes the form of a "new mysticism," a fideistic instance to which the redemption from loneliness is increasingly entrusted. Thus, the paradox of choice (Schwartz, 2005) is fulfilled: the hyper-fragmentation of content produces chronic dissatisfaction and a postural hunching over the display, ultimately compromising the forward-looking gaze projected toward the horizon (Marchetti, 2022).

Adolescent vulnerability and algorithmic mirroring

The adolescent condition represents the terrain of greatest vulnerability regarding these architectures. In a developmental phase where self-regulation skills are still consolidating (Erikson, 1995; Marcia, 1980), online interaction pushes the presentation of the self to extremes (Goffman, 1997), reducing identity to a permanent performance bound to quantitative metrics. The fragility of contemporary bonds is further exacerbated by the Fear of Missing Out (FoMO), which serves as a key predictor of problematic usage and psychological maladaptation (Beyens et al., 2016; Fioravanti et al., 2021).

This framework is compounded by "algorithmic mirroring" (Pariser, 2011): machine learning systems create information bubbles that constantly confirm pre-existing inclinations, trapping the subject and restricting the free exploration of alternative roles. The passive consumption of the digital flow induces an emotional anesthesia and an impoverishment of the narrative imagination (Nussbaum, 2006), replacing the creative word with pre-packaged signs that hinder a coherent biographical narrative (Rivoltella, 2017).

Pedagogical response: digital literacy and affective education

Faced with the de-symbolization of existence, pedagogy must foster critical and emotional resistance. It is urgent to develop a digital literacy that transcends mere instrumental skills, configuring itself, according to UNESCO (2018) guidelines, as the ability to evaluate and create information in a safe

and ethical manner. Consistently with the adult assumption of responsibility toward new generations (Arendt, 2023), educational action must integrate digital literacy with Goleman's (1995) paradigms of affective education.
The rehabilitation of foundational emotional competencies - specifically self-awareness and empathy - is essential to counter the compulsive use of devices linked to underlying difficulties in emotion regulation (Benedetto et al., 2024; Wang & Zhang, 2026).
Alongside this, the perspective of Corrado and Pasta (2024) in Artificial Intelligence and Wisdom of the Heart urges the retrieval of a wisdom-oriented, ethical dimension: the alliance between technology and consciousness must rest upon the care for the other and the custody of community bonds, preventing perennial connection from replacing authentic communion.
Conclusions: toward a pedagogy of presence
In conclusion, the recomposition of the described identity fracture demands a "pedagogy of presence," capable of opposing the systematic commodification of intimacy. Schools and educational institutions must configure themselves as communities of discourse and practice that restore formative value to error, waiting, and unproductive time.
Teaching younger generations how to interrogate information biases and the mechanisms of extractive capitalism represents the only viable path toward restoring an open, self-determined future. Only by combining media literacy with a profound affective education will it be possible to emancipate homo digitalis, enabling them to inhabit the onlife universe without losing their own humanitas and the fruitful beauty of the relationship with the other.

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The Role of Soccer eSports in Promoting Relational Awareness and Digital Responsibility

Ceruso Rosario

The rapid diffusion of eSports has profoundly changed the way young people interact, learn, and build social relationships. Soccer simulation games, such as EA Sports FC, are increasingly becoming environments where athletes cooperate, communicate, and negotiate shared experiences (1). While these platforms are often associated with entertainment, their educational potential remains largely unexplored. When embedded within structured pedagogical pathways, soccer eSports may contribute to the development of digital citizenship, affective literacy, social responsibility, and relational awareness, transforming gaming experiences into meaningful educational opportunities (2). Beyond their recreational function, digital gaming environments increasingly attract the attention of educators and sport scientists because of their potential to foster transferable life skills. When appropriately designed and supervised, eSports provide opportunities for communication, problem-solving, cooperation, ethical decision-making, and reflective learning. This educational perspective aligns with contemporary approaches to digital citizenship, which emphasise the responsible, critical, and socially aware use of technology, suggesting that virtual sporting environments may complement traditional youth sport in promoting holistic athlete development. However, the absence of appropriate guidance promotes isolation, passive technology use, and limited digital awareness.

Purpose

The aim of this study is to analyse the role of eSports as a tool for digital accountability and affective literacy, exploring their potential to promote social responsibility, relational awareness, and active participation among young athletes.

Method

Thirty-three youth soccer players (aged 15–19 years) voluntarily participate in a quasi-experimental repeated-measures study. Participants complete a researcher-developed 12-item Likert questionnaire before the intervention (pre-test), halfway through the educational programme (mid-test), and at its completion (post-test). The questionnaire assesses four educational domains: collaboration and active participation, emotional management and affective literacy, social responsibility and respect for rules, and digital awareness together with the educational value of eSports. The intervention consists of guided EA Sports FC activities designed to stimulate cooperative problem-solving, emotional reflection, digital fair play, critical discussion, and responsible online behaviour. Descriptive statistics are calculated for each assessment, while changes over time are analysed using the Friedman test. Kendall's coefficient of concordance (W) is used to estimate the effect size.

Results

The findings reveal progressive improvements across all investigated dimensions. In the collaboration domain, mean scores increase from values between 2.33 and 2.85 at baseline to 4.21–4.67 at post-test, indicating greater participation, teamwork, and collaborative attitudes. Emotional management also improves substantially, with participants reporting enhanced recognition of their own emotions, better frustration management, and increased empathy towards teammates. The highest post-test score is observed for the ability to understand teammates' emotions ($M = 4.73 \pm 0.45$). Similar trends emerge for social responsibility, where perceptions regarding respect for shared rules, digital fair play, and responsibility for maintaining a positive team climate increase from approximately 2.00 at baseline to values above 4.35 after the intervention. Digital awareness shows one of the largest improvements, with participants increasingly recognising the educational potential of soccer eSports and distinguishing educational from purely recreational technology use. Inferential analysis confirms statistically significant differences across all twelve questionnaire items ($p < .001$). Friedman chi-

square values range from 46.87 to 65.05, while Kendall's W ranges from 0.710 to 0.986, indicating consistently large effect sizes and substantial changes over time.

Discussion

These findings support the growing body of literature suggesting that eSports can represent valuable educational environments when accompanied by intentional pedagogical strategies. Rather than promoting passive gaming, the structured use of soccer eSports encourages cooperation, emotional regulation, critical reflection, and responsible digital behaviour (3). The guided activities appear particularly effective in transforming competitive gaming experiences into opportunities for social learning and the development of transferable competencies (4). Such evidence aligns with current perspectives on digital citizenship, highlighting that technology-mediated environments foster ethical behaviour, collaborative learning, and socio-emotional development when appropriately supervised by coaches and educators.

Some limitations should nevertheless be acknowledged. The relatively small sample size and the absence of a control group limit the generalisability of the findings, while the use of self-reported measures may introduce social desirability bias. Future studies should adopt controlled experimental designs, larger and more heterogeneous samples, and longitudinal follow-up assessments to verify the persistence of the observed educational effects.

Conclusion

In conclusion, soccer eSports should not be considered exclusively recreational activities but may become effective educational resources when integrated into structured training programmes. The present findings demonstrate that guided eSports experiences promote relational awareness, digital responsibility, emotional competence, and social participation among young athletes. These results encourage coaches, teachers, and sport educators to incorporate educationally designed eSports activities into youth sport programmes, contributing to the development of responsible digital citizens alongside competent athletes.

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Artificial Intelligence in Higher Education: Student Perceptions and the AI-mediated University Digital Citizenship Framework

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The study is grounded in the premise that generative AI is transforming the educational meaning of digital citizenship. Traditional approaches centred on digital competence are no longer sufficient to explain students' interactions with intelligent systems (UNESCO, 2023; Southworth et al., 2023). The proposed AI-mediated University Digital Citizenship Framework (AI-UDCF) conceptualises university digital citizenship through four interconnected dimensions: Responsible Participation, AI Literacy, Critical Awareness, and Ethical Responsibility.

Within this framework, the five dimensions measured by the PEHIA-TA questionnaire (AI Uses, Required Skills, Perceived Benefits, Perceived Problems, and Academic Integrity) are interpreted as empirical indicators of this emerging model of university digital citizenship. This perspective is consistent with recent studies arguing that AI literacy should be understood as a multidimensional educational competence integrating technical knowledge, ethical judgement, critical thinking, and responsible decision-making (Ayuso-del Puerto & Gutiérrez-Esteban, 2022; INTEF, 2024; Holmes et al., 2022).

Methodology

A quantitative descriptive-comparative design was employed with a sample of 546 undergraduate students enrolled in different degree programmes at the University of Granada. Data were collected using the PEHIA-TA (Perception of Higher Education Students about the Use of Artificial Intelligence Tools in Academic Tasks) questionnaire, a previously validated instrument comprising five complementary dimensions (Crisol-Moya et al., 2025). Descriptive statistics and Kruskal–Wallis tests were conducted to examine students' perceptions and identify possible differences across academic disciplines.

Main Results

The findings reveal generally positive perceptions of Artificial Intelligence among university students, accompanied by a strong awareness of the competencies and ethical responsibilities required for its appropriate use. Academic Integrity obtained the highest mean score, indicating that students consider transparency, honesty, and responsible AI use essential components of academic practice, in line with recent literature on ethical AI adoption in higher education (Williams, 2023; Yusuf et al., 2024).

Required Skills also received high scores, highlighting the importance attributed to critical thinking, prompt design, information evaluation, and reflective AI use, reinforcing recent proposals that position AI literacy as a core graduate competence (Southworth et al., 2023; INTEF, 2024).

Comparative analyses identified statistically significant differences across degree programmes only in AI Uses and Required Skills, whereas perceptions regarding benefits, risks, and academic integrity remained remarkably consistent across disciplines.

Discussion

The principal contribution of this study lies in reinterpreting the PEHIA-TA beyond its original psychometric purpose. Rather than viewing its five dimensions as independent constructs, they are understood as complementary indicators of AI-mediated University Digital Citizenship. Students' perceptions demonstrate that responsible AI use depends not only on technical competence but also on critical judgement, ethical reasoning, and informed decision-making, supporting recent calls for a

broader understanding of AI literacy and digital citizenship (Holmes et al., 2022; Selwyn, 2024; UNESCO, 2023).

Within the proposed AI-UDCF, Academic Integrity functions as the ethical mechanism regulating responsible participation, while AI Literacy becomes a constituent dimension of university digital citizenship rather than an isolated technological competence. The framework therefore integrates technological, pedagogical, and ethical perspectives into a coherent model for understanding AI-mediated higher education.

Conclusions

Generative Artificial Intelligence is redefining the educational meaning of digital citizenship in higher education. Universities must therefore move beyond teaching students how to use AI tools and instead foster the competencies, values, and ethical dispositions required for responsible participation in AI-mediated learning environments.

The PEHIA-TA questionnaire provides robust empirical evidence for analysing students' perceptions, while the proposed AI-mediated University Digital Citizenship Framework (AI-UDCF) offers an original conceptual contribution that connects AI literacy, responsible participation, critical awareness, and ethical responsibility within a unified model. This framework provides a useful basis for redesigning assessment practices, AI literacy programmes, and institutional governance, while opening new avenues for comparative and longitudinal research on university digital citizenship in the age of generative Artificial Intelligence (Baig & Yadegaridehkordi, 2024; UNESCO, 2023).

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Families in motion. The role of culture and media in the recognition of plural family experiences. A preliminary data analysis

Crisol Moya Emilio
Fiorucci Andrea

Contemporary scholarship has increasingly challenged essentialist and monolithic understandings of the family, traditionally grounded in the nuclear, heterosexual and two-parent model. Social, demographic, cultural and legal transformations have made visible a plurality of family forms through which care, belonging, responsibility and filiation are constructed. From a pedagogical perspective, the family should therefore be understood not only as a structure, but as a relational and symbolic process in which recognition, care and continuity are produced.

Within this framework, media and digital environments play a relevant role in shaping contemporary family imaginaries. Cinema, television, streaming platforms, social media and digital storytelling do not simply reflect family transformations; they also contribute to defining the models and criteria through which audiences interpret what may be socially recognised as "family". These representations may broaden the symbolic visibility of plural family experiences, but they may also reproduce stereotypes and hierarchies by presenting some family forms as ordinary and legitimate, while portraying others as exceptional, problematic or marginal.

Building on this theoretical framework, the present study explores university students' representations of family diversity, with particular attention to the role played by media, culture and other agents of socialisation. The study addressed three research questions: in which contexts do students encounter references to family diversity? Which agents of socialisation do they perceive as most influential in shaping their idea of family? How do media and digital environments contribute to the symbolic visibility of plural family experiences?

The research adopted a quantitative, descriptive and cross-sectional design. It was carried out within a scientific collaboration between the University of Salento, Italy, and the University of Granada, Spain. The sample consisted of 395 students enrolled at the University of Salento, selected through non-probability convenience sampling. Participants' ages ranged from 19 to 63 years (M = 29.71). The sample was predominantly composed of women (89.1%), followed by men (10.1%) and non-binary students (0.8%).

Data were collected between March and April 2026 through an online questionnaire administered via Google Forms. The instrument was based on an Italian translation and adaptation of the Questionnaire for Future Teachers on Family Diversity developed by Caurcel, Urdiales and Crisol. For the purposes of this contribution, the analysis focused on students' exposure to family diversity in different contexts and on the perceived influence of several agents of socialisation on the construction of their idea of family. Participation was voluntary and anonymous, and informed consent was obtained.

The results show that exposure to family diversity is not evenly distributed across the contexts considered. Media and digital environments emerged as the main spaces in which students encounter references to family diversity. Social media represented the context with the highest frequency of exposure: 62.3% of students reported encountering such references often or very often. Films, television series and streaming platforms also played a prominent role, with 56.0% reporting high exposure. Television followed, with 47.8%. Educational contexts showed a more moderate presence of the topic: university reached 45.9%, while primary education was the context in which students most frequently reported never having encountered references to family diversity.

A different pattern emerged when students were asked which contexts had most influenced the construction of their own idea of family. The family environment was perceived as the most influential agent: 60.3% of participants stated that it had influenced their idea of family a lot or very much. The peer group ranked second, with 38.2% reporting a high level of influence and 40.8% a

moderate influence. University showed a lower perceived impact, with only 19.3% reporting a high influence. Among media, films, television series and streaming platforms were the most influential, although responses were mainly concentrated around moderate levels.

These findings highlight an important distinction between exposure and perceived influence. Although students encounter family diversity mainly through media and digital environments, they continue to attribute the strongest influence on their own idea of family to family experience and peer relationships. Media therefore seem to perform a function of symbolic visibility and possible normalisation, broadening the repertoire of family configurations available in the public sphere. However, meaning-making processes remain closely connected to relational and everyday socialisation contexts.

In conclusion, the study suggests that family imaginaries are constructed through a multidimensional process in which personal experience, peer relationships, educational contexts and media culture operate simultaneously. From a pedagogical perspective, these findings are relevant for higher education and initial teacher education. Universities can promote critical reflection on family diversity and on the representations circulating in media and digital culture, supporting the development of more inclusive educational practices able to recognise the plurality of family realities present in society and in classrooms.

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Teaching beyond the machine: a three-year model of affective education and teacher transformation

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Gomez Paloma Filippo

Digital Affective Literacy connects affective signs with embodied experience, relational contexts, critical interpretation and ethical judgement. This contribution examines a three-year lower-secondary-school programme, launched in 2023/2024, as a pedagogical foundation for such literacy. Integrating Embodied Cognition, Social and Emotional Learning, ecological perspectives and the ICF biopsychosocial framework, the model conceives learning as embodied and situated (Barsalou, 2008; Bronfenbrenner, 1979; Varela et al., 1991; World Health Organization, 2001). Across three years, activities progressed from emotional literacy to cooperation, boundaries, consent, violence prevention and social responsibility, while teachers gradually moved from supported implementation to autonomous design and reflective mediation.

Methodology

The study adopted a longitudinal mixed-methods design integrating three sources of evidence. First, students' written, narrative and reflective productions from the first two years were examined through lexicometric and categorical analyses. Generated through expressive, bodily and relational activities, the materials were analysed inductively to identify recurrent socio-affective meanings (Charmaz, 2006), while lexical frequencies were interpreted qualitatively (Creswell & Plano Clark, 2018). Second, teachers' observations and feedback documented participation, relational dynamics, methodological adaptation and perceived professional change. Analysis focused on reflective mediation, professional autonomy and the progressive shift from externally led activities to teacher-led planning and implementation. Third, between March and April 2026, 121 students completed a structured questionnaire: 52 programme participants and 69 same-age non-participants. Likert-scale, multiple-choice, situational and open-ended items addressed emotional awareness and regulation, relationships, conflict, cooperation, respect, equality, jealousy, violence, consent and support networks. Open-ended responses were available from 52 participants and 64 comparison-group students. Questionnaire data were analysed descriptively through means, frequencies, high-response rates and percentages, while open responses contextualised numerical patterns. The final interpretation integrated students' discourse, questionnaire profiles and teacher feedback. Without inferential tests, pre-intervention measures or full control of contextual variables, findings remain exploratory and context-specific rather than causal or generalisable.

Findings

The longitudinal textual analysis showed a progressive reorganisation of students' discourse. First-year responses focused on immediate experience and activities, whereas second-year discourse connected emotional content more closely with relational, value-oriented and metacognitive dimensions.

Indicator	Change from Year 1 to Year 2	Main interpretation
Emotional field	35% to 32%	Remained central, with stronger links to relational meanings.
Experiential field	30% to 10%	Less description of activities; more interpretation of experience.
Relational field	15% to 28%	Relationships became an explicit object of reflection.
Value-oriented field	5% to 12%	Greater attention to respect, friendship and responsibility.
Cognitive/metacognitive field	10% to 13%	More references to understanding, reflection and interpretation.

Table 1. *Longitudinal development of students' socio-affective discourse.*

The emotional field decreased from 35% to 32%, while the relational field rose from 15% to 28%. The experiential field declined from 30% to 10%, alongside increases in value-oriented and cognitive-metacognitive meanings. Emotional and relational language represented about 60% of the second-year corpus, with frequent references to emotions, classmates, group work, friendship and respect. These patterns indicate a shift towards more articulated interpretations of emotions, relationships, cooperation and mutual support. Consistent with experiential learning (Kolb, 1984), affective competence emerged as the capacity to connect emotion, action, relationship and reflection. Percentages describe corpus organisation rather than programme effectiveness.

Teachers' professional transformation

Initially, teachers supported activities led by external professionals; during the second and third years, they progressively assumed responsibility for planning, adapting and implementing them. Feedback served as both a monitoring and reflective tool for interpreting participation, relational tensions, methodological choices and professional roles (Table 2). Teachers increasingly viewed themselves as designers of educational contexts and mediators of shared meaning. Their judgement remained essential because affective and relational events required contextual interpretation, ethical responsibility and attention to classroom dynamics rather than standardised procedures (Biesta, 2015; Schön, 1983).

Emerging category	Evidence	Professional significance
Participation	Students' engagement and willingness to share	From task monitoring to relational interpretation
Active methodologies	Theatre, music, writing and bodily activities	Recognition of embodied and non-transmissive learning
Reflective mediation	Linking activities to emotions and meanings	Teacher as mediator between experience and learning
Professional autonomy	Independent adaptation and planning	Internalisation and sustainability of the model
Collegial reflection	Shared discussion and supervision	Development of a collaborative professional culture

Table 2. *Dimensions emerging from the qualitative analysis of teacher feedback.*

Quantitative Findigs from the final Questionnaire

The questionnaire revealed a differentiated profile rather than uniform superiority among participants (Table 3). The comparison group reported higher competence in recognising emotions, respecting different opinions and intervening against peer mockery. Participants scored higher in emotional verbalisation, active listening, recognising dangerous jealousy, understanding consent and rejecting offensive behaviour.Jealousy was identified as dangerous by 88.5% of participants and 72.5% of comparison students; consent as always requiring respect by 67.3% and 60.9%; and offending others as never acceptable by 67.3% and 46.4%. Both groups reported difficulties with emotional regulation, help-seeking and conflict management. Parents and peers were the main support sources, while teachers were selected by only 3.8% and 2.9%. Moreover, 21.2% and 17.4% reported having no one to turn to, indicating that schools remain underdeveloped as emotionally accessible support environments. Results are descriptive; no inferential analyses were conducted.

Selected indicator	Participating group (n = 52)	Comparison group (n = 69)
Active listening	M = 3.90; 73.1% high	M = 3.81; 65.2% high
Offending others is never right	M = 3.81; 67.3% high	M = 3.38; 46.4% high
Jealousy recognised as dangerous	88.5%	72.5%
Consent must always be respected	67.3%	60.9%
Conflict management	M = 3.17; 36.5% high	M = 3.09; 39.1% high
Teachers as source of help	3.8%	2.9%

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Table 3: *Selected descriptive results from the final questionnaire*. M = mean on a five-point Likert scale.

Discussion
The integrated findings do not support a linear improvement model: participants were not consistently superior, but showed more articulated relational, value-oriented and reflective meanings concerning cooperation, respect, jealousy, consent and offensive behaviour. This confirms that socio-emotional competences require continuous, contextually embedded interventions (Durlak et al., 2011). Training, supervision and collegial feedback also supported teachers' shift from dependence on external professionals to greater professional appropriation. In hybrid environments, Digital Affective Literacy enables learners to distinguish affective simulation from embodied, reciprocal and ethically accountable relationships, while teachers safeguard the human purposes of education without rejecting technology.
Limitations
Without pre-intervention measures, full contextual control or inferential analyses, findings remain non-causal and context-specific. Self-reports, brief open responses, lexicometric corpus indicators and teacher feedback capture perceptions rather than effectiveness or observed practice. Digital Affective Literacy remains interpretative and prospective: no AI tools or human–machine interactions were tested; the contribution identifies relevant pedagogical competences and professional conditions.
Conclusions
The three-year model highlights continuity, embodied experience, reflective mediation, teacher education, supervision and student participation as key conditions for affective education. Outcomes emerged as shifts in emotional, relational and value-oriented meanings, alongside teachers' transition toward autonomous design and mediation. In AI-mediated contexts, Digital Affective Literacy requires embodied awareness, reciprocity, critical interpretation and ethical responsibility, enabling students to distinguish simulated affect from lived relationship.

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Violence, algorithms, and school: A quasi-experimental investigation into the effectiveness of digital affective literacy in middle school

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School violence mediated by technology cannot be reduced to individual pathology. Floridi's (2017) onlife framework dissolves the online/offline dichotomy: the filmed and shared violent act is a performative act structured by algorithmic engagement logic that rewards emotional intensity and polarization (Zuboff, 2019). The tool does not produce violence but creates conditions for its expression and amplification among affectively dysregulated subjects. Research question: does a structured digital affective literacy program reduce moral disengagement and improve hate speech recognition? Hypotheses: H1: EG scores significantly lower on MDS-B post-intervention; H2: EG shows significant HSRS improvement; H3: EG shows reduced observed classroom conflict.

Method

Participants. 95 students (M=16.4 yrs, SD=0.87; 52% male) from a Naples technical-vocational school (ESCS=−0.48). EG (n=48, 2 classes), CG (n=47, 2 classes) by draw. Non-probabilistic convenience sample.

Instruments. MDS-B (Bandura et al., 1996; Caprara et al., 2006): 32 items, 8 subscales, α=.87. HSRS (Fasoli et al., 2018): 20 items, cognitive α=.81, affective α=.78. SEC: weekly teacher observational form, k=.74.

Intervention — "Beyond the Screen": 12 weekly 100-min sessions, 3 modules: M1 — Anatomy of the Algorithm (sessions 1–4): reverse engineering of viral content, algorithmic non-neutrality. M2 — The Other's Body (sessions 5–8): digital role-playing, hate speech deconstruction, empathy recovery. M3 — From Reaction to Response (sessions 9–12): reflective pause techniques, co-designed digital class pact. CG: standard curriculum.

Analysis. ANCOVA, fixed class effects, T0 as covariate, R 4.4.1, Bonferroni correction; Cohen's d and η^2p.

Results

T0 comparability confirmed (MDS-B: t(93)=−0.57, p=.57; HSRS-cog: t(93)=−0.54, p=.59). At T1: MDS-B reduced in EG (b=−6.84, SE=1.92, p<.001, d=0.61); HSRS-cognitive improved (b=4.21, SE=1.48, p<.01, d=0.54); HSRS-affective marginally significant (d=0.38, p=.08), consistent with the longer timescales required for emotional change (Santerini, 2017). Largest MDS-B subscale effects: dehumanization (d=0.71) and diffusion of responsibility (d=0.63). SEC: EG −31% conflicts (4.7→3.2/week); CG −9% (4.4→4.0). Demand characteristics due to partial teacher awareness cannot be excluded.

Discussion and Conclusions

H1 and H2 are supported; H3 partially supported. Effect sizes (d=0.54–0.71) exceed standard SEL benchmarks (Durlak et al., 2011). Core limitations: few macro-units constrain internal validity; non-probabilistic sample prevents generalization; no longitudinal follow-up; transferability to ordinary conditions without dedicated staff is uncertain. The fundamental unresolved issue is structural asymmetry: 12 sessions versus 4–6 daily hours of recommendation-system exposure. The DSA represents a first insufficient step; without regulatory intervention, digital literacy risks functioning as individual deficit attribution, displacing structural responsibility from platforms (Mellace, 2026). Digital violence requires a constellation of interventions: classroom, family, social services, platform governance. Future studies: larger diversified samples; longitudinal design; teacher training as moderator; classroom-level relational outcome measures.

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Access to information and communication barriers in migrant integration processes: evidence from a qualitative study in Poland

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Based on twelve qualitative semi-structured interviews conducted at an integration centre for foreigners in Zielona Góra, Poland, the article analyses how access to information and communication barriers shape the early stages of migrant integration. It argues that integration depends not only on available services, rights and opportunities, but also on migrants' ability to know about, understand and use them. Arriving in a new country therefore also means crossing an informational and communicative boundary.

The research is grounded in a perspective that understands integration as a multidimensional process, involving material, social, institutional and relational dimensions (Ager & Strang, 2008). Alongside this perspective, the study adopts an informational lens: in order to navigate a new context, migrants need to understand procedures, documents, services, access channels and institutional points of reference. Studies on refugees' "information landscapes" show that migration involves entering environments made up of rules, documents, institutions and relationships that must gradually be understood (Lloyd et al., 2017). Oduntan and Ruthven (2020) also show that refugees' information needs emerge in concrete situations of uncertainty and influence their ability to make decisions.

The Polish case is particularly relevant in light of recent migration transformations. In 2024, around 180,000 new immigrants obtained a residence permit in Poland for more than twelve months (OECD, 2025). As of 30 April 2026, Poland also hosted 971,255 people from Ukraine under temporary protection (Eurostat, 2026).

The interviews involved adult participants from Ukraine, the Philippines, Colombia, Belarus and Cuba. The thematic analysis identified six macro-themes: language as an infrastructure of integration; the centre as a legal-institutional mediator; relational capital and the quality of reception; differentiated empowerment; cultural and community integration; and communication and access to information as a critical node of integration.

The findings show that language is perceived not only as a communicative skill, but as a condition of access. Knowing Polish enables participants to understand documents, interact with offices and services, look for work and reduce their dependence on intermediaries. Language also has an emotional dimension, as it helps people feel less isolated and more confident in everyday relationships.

The centre emerges as a space of mediation between migrants, the local territory and institutions. Administrative and legal support, translations, guidance on documents and information meetings make a system that many newcomers initially experience as fragmented and difficult to read more understandable. In this sense, the centre translates not only words, but also procedures, expectations and possibilities.

Another finding concerns the relational dimension. Staff availability, trust and organisational flexibility encourage participation. People seek information in places and relationships where they feel safe to ask, make mistakes, return and try again. For some, especially older or more vulnerable participants, the centre is also a space of socialisation and belonging.

Communication remains the critical issue. Some participants discovered the centre only after several months in Poland, often through Facebook, informal networks or co-nationals. This confirms the role of migrant networks and social media in the circulation of information, but also their limits in terms of accessibility and reliability (Dekker & Engbersen, 2012). Digital technologies and informal actors can facilitate access to information, but they do not replace mediation, trust and offline support in integration pathways (Mena Montes et al., 2026).

The study concludes that initial integration is also a process of informational orientation. A service is accessible not only when offered, but when people know it exists, understand it and feel able to use it. Good communication is therefore not an organisational detail, but a concrete form of reception.

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Affective Affordances in AI-Mediated Learning: A Scoping Review on Adolescent Motivation and Psychological Needs

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The growing integration of generative artificial intelligence (GenAI) in secondary education raises urgent questions about how AI-mediated interactions shape the emotional and motivational dimensions of learning. While much of the discourse on AI in schools has focused on content delivery and academic performance, far less attention has been paid to the affective dynamics that emerge when adolescents engage with conversational agents and adaptive tutoring systems. This paper addresses that gap by examining whether and how AI-mediated learning environments can serve as a "Strategic Mediators". Four theoretical lenses structure the inquiry: Self-Determination Theory (SDT; Ryan & Deci, 2000), the Control-Value Theory of Achievement Emotions (Pekrun, 2006), the broaden-and-build theory of positive emotions (Fredrickson, 2004), and the concept of affective affordances (Gibson, 1979; Norman, 2013; Ahmed, 2024). Together, these frameworks foreground three core psychological needs: epistemic curiosity, perceived competence, and relatedness, as the principal outcomes through which AI design choices can either support or undermine adolescent learning and well-being.

Methodology

The study adopts a scoping review design, following the PRISMA extension for Scoping Reviews (PRISMA-ScR; Tricco et al., 2018). Searches were conducted in May–June 2026 across three bibliographic databases – ERIC, Scopus, and Web of Science – using query strings combining three thematic clusters: GenAI tools, affective and motivational constructs, and secondary educational contexts. Inclusion criteria required studies to involve a direct AI-based intervention targeting learners aged 11–18, to examine at least one psychological or motivational variable, and to have been published between 2022 and 2026, a period that marks the public emergence and rapid diffusion of Generative AI models. Only peer-reviewed journal articles and conference proceedings in English were retained. The selection process followed four sequential PRISMA phases. An initial pool of 90 records was retrieved, of which 31 duplicates were removed. Screening on titles and abstracts excluded a further 30 records due to misaligned populations, missing affective variables, or ineligible publication types. Full-text assessment of the remaining 29 reports led to the exclusion of 8 additional studies. A final corpus of 21 studies was thus retained for synthesis.

Results

The 21 included studies span diverse international settings across Asia, Europe, North America, and the Mediterranean Area, published between 2022 and 2026. The methodological corpus is heterogeneous: ten studies used quantitative designs (experimental, longitudinal, structural equation modelling), eight used mixed methods, two were purely qualitative, and one used a Wizard-of-Oz paradigm. Thematic synthesis identified five domains. First, AI environments consistently reduced performance-related anxiety (particularly in foreign language reading and mathematics), through non-judgmental, personalised feedback. Second, AI tools fostered epistemic curiosity and exploratory engagement when learners received scaffolded opportunities to investigate problems across domains. Third, autonomy-supportive and competence-affirming AI features were associated with higher intrinsic motivation, with teacher scaffolding as a critical moderator. Fourth, adolescents frequently attributed social qualities to AI agents, constructing relational meanings. Fifth, adaptive AI systems reduced cognitive load and promoted inclusion for underserved learners, corroborated by physiological evidence from electrodermal activity data.

Discussion

The findings suggest that GenAI tools might function as elements of an affective ecology; when designed around clear goals, scaffolded feedback, and opportunities for exploration, AI systems satisfy adolescents' needs for autonomy, competence, and relatedness, thereby fostering intrinsic engagement in line with SDT. The CVT framework clarifies the underlying mechanism: design choices enhancing perceived control and task value produce positive achievement emotions, while opaque interfaces and rigid feedback generate anxiety and boredom. The broaden-and-build theory adds a further layer: positive affect triggered by well-designed AI interactions may expand learners' exploratory repertoires and accumulate durable resources including self-efficacy and metacognitive skill. Affective affordances, understood as emergent from the student–technology–context triad, capture these dynamics transactionally.

A critical dimension concerns identity: several studies indicate that adolescents increasingly frame AI as a social partner. Emotional intelligence and mindfulness appear as protective factors against loss of epistemic agency, arguing for educational designs that cultivate students' self-perception as curious and ethically responsible agents. Methodological limitations include heavy reliance on self-report measures, cross-sectional designs, and small samples; rapid technological change also constrains temporal generalizability.

Conclusion

Generative AI, when pedagogically calibrated, can act as a Strategic Mediator supporting affective regulation, epistemic curiosity, and motivational self-determination in secondary school students. These outcomes depend on deliberate interaction design aligned with established motivational frameworks and sustained human oversight, not on the technology per se. Future research should pursue longitudinal, mixed-methods designs integrating physiological and behavioural data alongside self-report measures, and should interrogate the long-term implications of AI-mediated identity construction for adolescent well-being and epistemic agency.

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Digital Affective Literacy and Digital Well Being Awareness in Teacher Training Contexts

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The growing diffusion of digital technologies has profoundly transformed educational contexts, making digital well-being an increasingly relevant dimension of teacher education. Beyond technical competence, teachers are expected to develop critical, relational, and emotional skills that enable them to promote responsible and inclusive digital practices (Redecker, 2017; Vuorikari et al., 2022). Within this perspective, digital well-being is understood as a multidimensional construct integrating emotional resilience, self-regulation, social connection, and the quality of online relationships (Liberacka-Dwojak et al., 2026). Recent studies have also highlighted the importance of extending the concept of digital literacy by including affective and relational dimensions, giving rise to the emerging perspective of Digital Affective Literacy. This study explores perceived digital well-being among pre-service support teachers enrolled in the Primary Teacher Support Specialization Course (TFA) at Pegaso Online University.

Method

The study involved 82 students attending the Primary Teacher Support Specialization Course during the 2025–2026 academic year. Data were collected through the Digital Wellbeing Questionnaire (DWBQ) (Liberacka-Dwojak et al., 2026), translated and linguistically adapted into Italian. The questionnaire includes 13 items rated on a seven-point Likert scale and measures four dimensions: Emotional Resilience, Agency, Social Connection, and Communion. Participants also completed an open-ended question exploring how digital environments and social media influence their well-being. Quantitative data were analysed using descriptive statistics, while qualitative responses were examined through thematic analysis.

Results

Overall, participants reported positive levels of digital well-being. Communion showed the highest mean score (M = 5.96), followed by Agency (M = 5.30), Emotional Resilience (M = 4.90), and Social Connection (M = 4.13). The highest-rated items concerned responsible content sharing, kindness, and respectful online behaviour, suggesting that participants associate digital well-being primarily with the quality of online relationships rather than with the frequency of online interactions. The qualitative findings complemented these results by revealing a balanced perception of digital technologies. Participants recognised their educational and communicative potential while also identifying challenges such as information overload, unreliable online content, and excessive social media use. Many respondents emphasised that the impact of digital technologies depends largely on conscious and balanced use.

Discussion and Conclusions

The findings support the interpretation of digital well-being as a multidimensional construct shaped by emotional, relational, and self-regulatory factors rather than by technology use alone. The prominence of Communion and Agency suggests that respectful relationships and responsible self-regulation represent key components of positive digital experiences. These results are consistent with recent literature highlighting the importance of emotional and ethical dimensions within digital environments (Liberacka-Dwojak et al., 2026; Vanden Abeele, 2021). From this perspective, Digital Affective Literacy may represent a meaningful extension of traditional digital literacy by integrating emotional awareness, relational competence, and responsible digital behaviour. Although this construct requires further empirical validation, the present findings suggest that promoting digital well-being should become an integral component of initial teacher education. Future studies should

involve larger and more diverse samples and further investigate the role of affective competencies in fostering healthy and inclusive digital learning environments.

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Teachers' Cultural Positionings and Attitudes of Artificial Intelligence in Education: Evidence from an Italian Descriptive Study

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Artificial Intelligence (AI) is playing an increasingly significant role in educational contexts, offering new opportunities for learning personalization, instructional design support, and the inclusion of students with diverse educational needs. At the same time, the spread of generative AI systems and intelligent teaching tools raises questions regarding the ethical, professional, and pedagogical aspects of their use. National and international literature highlights how teachers' attitudes constitute a central variable in the processes of acceptance and integration of innovative technologies, significantly influencing teaching practices and school innovation pathways (Wilson, 2023; Galindo-Domínguez et al., 2024; Perla et al., 2025).

Within this framework, the present study aims to explore Italian teachers' attitudes toward AI in educational contexts, with particular attention to its applications in teaching–learning processes and in supporting students with disabilities. The study seeks to understand teachers' level of familiarity with such technologies and to analyze how they interpret the opportunities and limitations of AI in school contexts.

The research adopted a quantitative descriptive-exploratory design using a self-administered online questionnaire. The sample consists of 682 Italian teachers, of whom 52.5% are special education teachers and 47.5% are general education teachers. Data collection took place between March and September 2025 via Microsoft Forms. The instrument used derives from the questionnaire developed by Alsudairy and Eltantawy (2024), subsequently validated in the Italian context through exploratory and confirmatory factor analysis (Fiorucci & Bevilacqua, 2026). The final version includes 32 items organized into two correlated factors; items were assessed using a three-point Likert scale.

The results show a predominantly low-to-medium level of familiarity with AI-based technologies, reported by 77.9% of the sample.

Regarding attitudes, the overall score (M = 2.31), obtained as the mean of the 32 questionnaire items corresponding to the two identified dimensions (Factor 1 and Factor 2), indicates a generally positive orientation toward AI in educational contexts. This value suggests that, overall, teachers tend to recognize the potential of AI as a resource for improving teaching and learning processes, showing a prevalence of favorable evaluations over disagreement. However, consistent with the findings emerging from the analysis of the individual dimensions, the overall result also reflects a non-uniform attitude. Alongside a generally positive evaluation, a component of caution emerges, particularly with regard to the practical applications of AI in teaching practice and in assessment and inclusion processes.

Therefore, the overall score confirms a favorable perception of AI among teachers, although this openness is accompanied by a degree of prudence that highlights the need for further training initiatives and the progressive strengthening of digital and pedagogical competences related to the use of such technologies.

Analyzing the two factors separately, the first factor shows that teachers recognize the potential of AI mainly in relation to learning personalization, the diversification of teaching strategies, and the adaptation of materials for students with disabilities. Particularly high levels of agreement emerge regarding the use of AI to create simulated lessons, support understanding of technological principles, and optimize the time required to adapt instructional resources.

However, this openness does not translate into unconditional acceptance of the technology. Items suggesting the delegation of educational decisions to AI show very high levels of disagreement. Teachers reject the idea that intelligent systems can replace teachers' professional judgment or assume

an autonomous role in complex decision-making processes. This finding suggests a view of AI as a support tool rather than a substitute for educational action.
The second factor also shows a generally positive orientation. Participants recognize the technology's potential to provide feedback, support the understanding of complex concepts, simplify information, and enhance accessibility in learning. At the same time, many items show high percentages of neutral responses, particularly those related to advanced personalization of learning pathways, assessment of students with disabilities, and the promotion of lifelong learning. This neutrality appears to reflect not a rejection, but rather a cautious evaluation, as noted above, stemming from limited direct experience with such tools.
The analysis of composite scores confirms this orientation. Factor 1 shows a mean of 2.43, while Factor 2 shows a mean of 2.20. The difference between the two dimensions suggests that acceptance of the theoretical potential of the technology is higher than confidence in its concrete implementation in educational settings.
The results allow teachers' attitudes to be interpreted not as a simple favorable/unfavorable dichotomy, but as complex professional positions in which interest, selective trust, caution, and training needs coexist. AI is perceived as a useful resource for promoting inclusion, personalization, and pedagogical innovation, but its use appears to be conditioned by the maintenance of educational responsibility and the central role of teachers in decision-making processes.
The study therefore highlights the need to invest in both initial and in-service teacher education pathways aimed not only at developing technical skills, but also at fostering a critically grounded and pedagogically informed AI literacy (Vrasidas & McIsaac, 2001; Ertmer, 2005). From this perspective, the integration of AI in schools requires professionals capable of critically interpreting the opportunities offered by technology, assessing its limitations, ethical implications, and educational consequences. Innovation, in fact, does not depend solely on the availability of tools, but on the capacity of professional communities to guide their use toward inclusive and educational goals (Di Martino, 2024; Nirchi et al., 2025; Nazaretsky et al., 2022).

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AI and development of critical thinking and emotional awareness in primary school: the "Sensitive-Extended Reality" (SXR) Environments

Guarcello Emanuela

Artificial Intelligence is rapidly becoming part of children's everyday lives, while educational research continues to highlight the persistence of widespread anthropomorphic misconceptions about AI and the limited availability of pedagogical models capable of fostering critical understanding and ethical awareness. Although Extended Reality (XR) has demonstrated considerable potential for enhancing motivation and engagement, its contribution to higher-order reflective competences remains underexplored. In particular, few studies have investigated how semi-immersive environments may promote problematization, ethical deliberation and the revision of misconceptions through aesthetic experience.

Within this framework, the CAIRƐ International Research Project, developed at the University of Turin, proposes the XR Sensitive Scenario as a pedagogical framework for designing semi-immersive learning landscapes. Drawing upon Dewey's theory of aesthetic education, Montani's techno-aesthetics and the experience of Studio Azzurro's Sensitive Environments, the framework conceives the virtual landscape as an educational space in which children are invited to perceive, interpret and collectively deliberate on complex socio-technological issues. Rather than presenting predetermined information, the landscape encourages reflective exploration, dialogue and the progressive revision of intuitive conceptions.

The framework has been implemented through the Gaia Sensitive Scenario, a semi-immersive XR environment designed for children aged 8–11 years. The experience unfolds through two interconnected explorations. The first focuses on technological innovation within a pictorial representation of Gaia, the living Earth, where children investigate technological transformations introduced by humans across history. The second takes place inside a virtual cave devoted to Artificial Intelligence, where children collaboratively explore questions and answers concerning AI while confronting three major categories of misconceptions identified in the literature: non-technological AI, anthropomorphised AI and hyper-human AI. Throughout the experience, aesthetic immersion is constantly integrated with collaborative reflection, argumentation and ethical deliberation.

The implemented version of Gaia was tested during the 2025–2026 academic year with approximately 130 fourth-grade pupils from two comprehensive schools in Turin. The study adopted a participatory action research approach supported by a mixed qualitative-quantitative design. Learning outcomes were evaluated through pre- and post-questionnaires, content analysis of children's written responses and reflexive thematic analysis of classroom dialogues and teachers' interviews.

The findings provide encouraging evidence of the educational potential of XR Sensitive Scenarios. Correct responses to the AI misconception questionnaire increased between 23.9% and 51.5%, depending on the statement considered. When children's rewritten statements were also analysed qualitatively, improvements ranged from 47.1% to 65.6%, demonstrating a broader conceptual revision than that captured by quantitative scores alone. Beyond conceptual accuracy, children showed substantial improvements in argumentation, logical organisation, lexical precision, problematization and ethical reasoning. The intervention proved particularly effective in reducing anthropomorphic misconceptions, such as attributing emotions, intentionality or superhuman capabilities to AI systems.

The findings also suggest that aesthetic experience represents a significant pedagogical mediator for AI literacy. Rather than transmitting predefined knowledge, the Sensitive Scenario encourages children to critically examine their own intuitive beliefs, negotiate meanings collectively and construct more responsible interpretations of emerging technologies. In this perspective, the XR

environment functions as a pedagogical landscape where perception, imagination, reflection and ethical judgement continuously interact.
Overall, the study suggests that XR Sensitive Scenarios represent a promising pedagogical framework for promoting critical thinking and emotional awareness in primary education. Future developments will extend the Gaia Scenario beyond laboratory settings through portable XR technologies, particularly smart glasses, enabling situated educational experiences directly embedded within natural, cultural and community environments. This evolution is expected to strengthen the relationship between embodied cognition, aesthetic experience and responsible interaction with Artificial Intelligence, while expanding the educational applicability of XR Sensitive Scenarios to a wider range of non-formal and outdoor learning contexts.

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Digital affective literacy and artificial intelligence in lower secondary school.

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The introduction of generative artificial intelligence into school environments cannot be interpreted as a mere expansion of the educational toolkit. It affects the very architecture of the educational experience, altering the coordinates through which epistemic authority, relationships, and pedagogical mediation are understood. If, as Floridi (2014) argues, the contemporary condition is characterized by a progressive integration between online and offline, the school can no longer be conceived as a physical environment assisted by technologies, but rather as a node within the infosphere where the human and the artificial permanently cohabit. Conversational systems based on large language models occupy a peculiar position in this scenario. Unlike previous educational technologies, they do not limit themselves to providing content or structuring exercises; instead, they produce dialogic, contextualized, and adaptive language. This linguistic performativity allows them to be perceived as interlocutors rather than mere tools. The literature has highlighted the risks of a technocentric interpretation of educational innovation (Zhao, 2019) and has problematized the functional anthropomorphism that accompanies the design of empathetic agents (Coeckelbergh, 2020). Furthermore, Turkle (2011) has shown how interaction with responsive devices can generate forms of parasocial attachment, especially in younger subjects. However, this perspective implicitly tends to consider minors as predominantly vulnerable to simulation. The present work positions itself differently, aiming to explore through a theoretical-reflective lens whether pre-adolescents are capable of exercising a form of discernment toward conversational AI.

Methodology

Pedagogical approach

The complexity of the phenomenon guided the design toward an experience inspired by action-research (Lewin, 1946), deemed appropriate for observing pedagogical dynamics within their ecological context while simultaneously promoting reflective and meta-cognitive processes among the participants. The objective was not to quantitatively measure psychological variables, but rather to understand the qualitative ways in which students interpret and navigate the experience of interacting with an empathetic conversational agent.

Context and field dynamics

The work took place in a third-year class of an urban public lower secondary school, involving 19 students aged between 12 and 13 years old, integrating into the regular classroom activities and focusing on the use of a conversational agent based on a large language model. To foster critical media literacy, the chatbot was configured via a specific system prompt designed to intentionally emphasize empathetic linguistic markers, such as simulated expressions of understanding, emotional validation, and affective reassurance. Rather than presenting a neutral or purely functional tool, the objective was to make the artificial affective dimension highly salient, providing a pedagogical stimulus to prompt collective reflection and observe the students' spontaneous reactions.

Educational procedure and reflections

The activity was structured around three phases. First, students interacted with the agent during a standard disciplinary task to analyze its conversational capabilities firsthand. Second, this interaction was accompanied by participant observation and the collection of general field notes focusing on recurring relational dynamics, such as the attribution of intentionality, the perception of emotional authenticity, and the interactions with the teacher. Finally, a collective, reflective classroom discussion was conducted to allow students to verbally re-elaborate their experience. The insights

discussed below derive from the integration of these observational field notes and the students' shared reflections.

Observational insights and results

The qualitative analysis of the classroom experience revealed a significant capacity among students to maintain a clear distinction between the formal correctness of an utterance and the actual presence of a living, experiencing subject. The agent's pre-programmed empathetic formulas did not elicit genuine affective adherence; instead, they frequently triggered irony, healthy skepticism, or critical detachment among the learners. While the students readily acknowledged the system's instrumental and informational utility for school-related tasks, they consistently denied its capacity to "truly feel." In their spontaneous feedback and collective debriefings, students explicitly highlighted the machine's lack of a body, lived history, and genuine accountability. Their critique did not target the agent's cognitive or computational competence, but rather its implicit claim to emotional reciprocity. Furthermore, a significant behavioral dynamic was observed in the classroom setting: when faced with complex problem-solving or moments of uncertainty, students consistently alternated between interacting with the chatbot and seeking the physical gaze of the teacher. This visual and relational counterpoint suggests that the embodied, responsible presence of the educator remains the primary epistemic and emotional anchor for validation. The empathetic simulation thus functioned as a device of contrast: rather than dissolving the educational relationship, it rendered its embodied specificity more evident.

Discussion

The results problematize the widespread assumption that pre-adolescents are inherently and uncritically vulnerable to technological anthropomorphism. A critical competence emerges, enabling them to distinguish between the linguistic expression of emotion and lived intentionality. This distinction implicitly recalls the phenomenological tradition that links empathy to embodied presence and situated reciprocity. This response should not be interpreted as a rejection of technology, but rather as the capacity to place the phenomenon within appropriate boundaries. From this perspective, AI can assume the function of a critical transitional object: not an affective partner, but a device through which to clarify what makes an educational relationship authentic. Digital affective literacy is therefore configured as a competence that allows individuals to consciously inhabit the hybrid spaces of the infosphere, recognizing the instrumental value of AI without attributing a full relational status to it.

Conclusion

Interaction with a conversational agent designed to simulate empathy does not produce a replacement of the teacher-student bond. On the contrary, it reveals by contrast the unique specificity of the educational presence: intentional, embodied, and ethically accountable. Under the perspective of not being adopted as an affective partner, AI can become a valuable pedagogical opportunity to develop a mature form of digital affective literacy grounded in the awareness of the limitations of simulation. Considering the preliminary nature of this intervention, understood as an initial exploratory attempt in the field, future directions will aim at designing structured pathways where data can be collected in a formally rigorous manner.

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Impact of game digital intervention for physical health and quality of life in children as tool pharmacy: systematic review

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International recognition of prevention and health promotion redefines these issues as pillars of a comprehensive educational programme aimed at teaching individuals to look after themselves and their community. This vision is supported by The Global Charter (WFPHA, 2024) and by various definitions from the World Health Organisation (WHO, 1948; WHO, 1986). However, despite the benefits of physical exercise within healthcare processes (Martinsen, 1985; Pasanisi, 2019; Serrat, 2020), we are still witnessing an increase in sedentary lifestyles, particularly amongst younger people, caused by the excessive use of electronic devices. Against this backdrop, gamification (Detering, 2011) and exergames (or active video games) (Sall & Grinter, 2007; Yang, 2010) are emerging as educational and psychophysical mediators, as well as stimulators of psycho-emotional components (Huang, 2018; Marques, 2023). Although the effectiveness of these tools is well documented, the current challenge lies in identifying frontline interventions to reach young people. Local pharmacies, as centres for healthcare services and health promotion, are ideally suited to becoming venues that educate people about personal wellbeing. This systematic review has two objectives: 1) to assess the impact of digital interventions based on exergames on physical health and quality of life in a population aged between 10 and 25; 2) to assess their potential integration into pharmaceutical care services for the promotion of wellbeing within the local community.

Methods

The review was conducted in accordance with the PRISMA guidelines (Page, 2020) and pre-registered on PROSPERO. A comprehensive literature search was carried out across four databases (ERIC, Scopus, PubMed and OpenAIRE), limiting the records to studies published between January 2021 and June 2026 in English, Italian and Spanish. Based on the PICO model, the eligibility criteria included children (>10 years) and young adults (up to 25 years), excluding interventions not centred on physical activity, such as virtual reality or rehabilitation. Data extraction was carried out using an automated approach involving Artificial Intelligence (AI), followed by manual verification. Risk of bias and methodological quality were assessed using the Study Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies developed by the NHLBI/NIH, applying 14 specific items.

Results

The screening identified 10 eligible studies conducted in Europe, the United States, Brazil and Asia, comprising 7 randomised controlled trials (RCTs), 2 within-subject experimental studies and 1 randomised controlled crossover study, involving a total of 498 participants (aged 10–25 years). The risk of bias analysis (NHLBI) revealed a high standard of quality: 90 per cent of the studies (n=9) were rated ‘Good’ and 10 per cent (n=1) ‘Fair’. In terms of motor outcomes and well-being, integrated interventions based on nutritional education combined with Nintendo Wii sessions demonstrated significant reductions in BMI and percentiles among overweight or obese students, improving dietary habits (Erçelik & Çağlar, 2023) and altering body composition in the long term (Suarez-Villadat et al., 2023). Significant improvements have been observed in muscle strength, agility, speed and cardiovascular endurance (Ketelhut et al., 2022; Lin et al., 2025; Suarez-Villadat et al., 2023). Compared with traditional calisthenics or dodgeball sessions, conventional training can yield higher average heart rates and repetition volumes (da Silva et al., 2022; Philippe et al., 2024), but exergames

demonstrate a lasting positive impact on health-related quality of life (Yu et al., 2023). From an educational and behavioural perspective, digital motor games reduce levels of depression and anxiety (Erçelik & Çağlar, 2023; Li et al., 2025), counteracts a sedentary lifestyle by increasing active time (Bowling et al., 2021) and optimises affective responses, alertness and executive functions such as working memory (Gu et al., 2025; Li et al., 2025).

Discussion and conclusion

The evidence gathered confirms that exergames act as effective educational and behavioural facilitators in healthy individuals and vulnerable populations, including those with neurodevelopmental or psychiatric diagnoses (Bowling et al., 2021), obesity (Erçelik & Çağlar, 2023) or Down's syndrome (Suarez-Villadat et al., 2023), improving sleep quality and social relationships. Although the literature highlights a lack of evidence within pharmaceutical contexts, the accumulated theoretical background fully justifies their potential integration into community pharmacy care services. Such implementation would promote greater education, increased engagement with younger people and healthier lifestyles. Future research should therefore focus on planning trials set directly within community pharmacy settings to validate the model's effectiveness in practice.

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Self-Regulated Learning and Prosocial Behavior: Implications for Digital Affective Literacy

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Self-Regulated Learning (SRL) is widely recognised as a framework for understanding how students regulate their cognitive, motivational, and behavioural processes during learning (Zimmerman, 2002; Panadero, 2017). Beyond its contribution to academic achievement, increasing evidence indicates that SRL also supports socio-emotional competences, including empathy, cooperation, and prosocial behaviour (Eisenberg et al., 2010; Song et al., 2018). These competences are particularly relevant in technology-enhanced learning environments, where students are required to learn autonomously while participating responsibly in digital communities (Milenkova & Lendzhova, 2021).

The study found a positive and statistically significant association between SRL and prosocial behaviour, indicating that students with higher levels of self-regulation also reported greater helping and cooperative behaviours. Notably, the relationship emerged only for the overall SRL score, whereas individual motivational and cognitive dimensions were not significant when analysed separately. This finding suggests that prosocial behaviour depends on the integration of cognitive, metacognitive, motivational, and behavioural processes rather than on isolated SRL components (Pintrich, 2000; Panadero, 2017).

These findings have important educational implications. Promoting self-regulation through goal setting, planning, self-monitoring, formative feedback, and metacognitive reflection may simultaneously enhance learning effectiveness and foster collaboration, empathy, and responsible participation in digital environments (Zimmerman, 2002; Dignath & Büttner, 2008). In this perspective, SRL represents a key competence for supporting both academic success and students' personal and social development.

Although based on a relatively small sample, the study provides preliminary evidence that integrating cognitive and socio-emotional perspectives can enrich research on digital education. Future studies involving larger and more diverse samples, longitudinal designs, and technology-enhanced interventions are needed to clarify how self-regulated learning contributes to prosocial development and responsible digital participation.

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Telling otherwise: training youth worker for LGBTQIA+ storytelling in the Queer Media Education framework

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Contemporary media environments are marked by pervasive algorithmic mediation. Algorithmic systems and generative AI organise visibility, deciding which stories circulate and which become difficult to find (Noble, 2018; Messina & Mascitti, 2026). LGBTIQA+ young people occupy a paradigmatic position: platforms often provide access to peer communities and vocabularies for naming experience, while also reducing the visibility of minoritised voices through shadow banning, opaque moderation, and the classification of queer content as sensitive. The digital environment is therefore both a resource for identity exploration and a device of invisibilisation.

This condition raises an educational question that traditional digital storytelling is not fully equipped to answer. Consolidated by Lambert (2013), that tradition guides participants from a meaningful topic to a short multimodal artefact. Yet it was developed before algorithmic distribution became ordinary, and it can imply that publishing a story is equivalent to making it public. In algorithmic environments this equivalence no longer holds: a well-produced queer story may be classified as sensitive, shadow-banned, misread by hostile publics, or detached from its author's intended meaning. Technical competence must therefore be joined by an understanding of how ranking and moderation govern content after it is posted.

The ECHOES train-the-trainers programme, a sixty-hour pathway involving 16 youth workers from EU and framed through Queer Media Education (Messina, 2025), offers situated evidence for rethinking this relationship. The study used a pre-post self-perception design within an intrinsic case study, complemented by open-ended responses. The data do not establish causal efficacy, but trace a situated learning process within a small professional cohort.

The first pattern concerns affective care. Participants entered the pathway already declaring high competences in safe-space practices, boundary negotiation, active listening, and consent. In the paired subset, Safe space and queer care moved only slightly (+0.28), from already high entry values, confirming a ceiling effect. For professionals in queer-led and human-rights organisations, affective care is not built from zero but precedes training.

The second pattern concerns what the pathway actually constructed: the accompaniment of content through its public life after publication. In the paired subset, the largest area-level increases concerned Creating with media (2.73 to 4.11, +1.38), Advocacy & public sharing (3.12 to 4.45, +1.33), and Design & facilitation (3.26 to 4.41, +1.15). At item level, the strongest movements involved choosing the most suitable media format for a message (+1.86), deciding whether to keep, modify, or withdraw content after circulation (+1.80), accompanying media production (+1.80), and making little-represented perspectives visible (+1.71). The open-ended questions converged: at exit, post-publication care moved from an anticipated need to an operational competence naming after-effects, emotional struggle, risk assessment, plural audience interpretations, and conflict management.

A third pattern qualifies this picture. AI-related media management started from the lowest entry mean among the core areas and remained below the others after the pathway (+0.68). The item concerning transparent disclosure of AI use barely moved, from 3.60 to 3.80 (+0.20). Participants did not approach these systems naively: their responses already expressed a critical stance on environmental impact, artists' rights, and privacy opacity, a disposition the AILit framework (OECD, 2026) recognises among the attitudinal components of AI literacy. What they lacked was not ethical sensitivity but repeated occasions to translate it into situated professional decisions. AI literacy for queer youth work therefore requires slower, recurring practice cycles.

The pedagogical implication reorganises the grammar of digital storytelling for algorithmic publics. If affective care is a precondition rather than an objective, and if the main formative gain concerns the afterlife of content, then publication can no longer be treated as the endpoint of the educational process. The finished artefact enters a public life over which its author has limited control, exposed to audiences, reuse by other users, and algorithmic logics of amplification or invisibilisation. Accompanying that afterlife is an educational task in its own right, one that traditional digital storytelling leaves undertheorised. In Queer Media Education, this is the space of Emancipatory Release: not a point of arrival, but continued accompaniment sustained by queer care and feedback. This reframing has direct consequences for educational design in the age of AI. Curricula for youth workers should not devote scarce time to building an affective care this professional figure already possesses, nor treat privacy, consent, and visibility as preliminary warnings before production begins. They should instead extend care across the whole trajectory of the content: when participants choose a story, select images or voices, decide whether to use generative tools, publish, and evaluate circulation. In algorithmic publics, teaching young people to tell their stories is no longer enough. Education must accompany what happens once the algorithm, not the author, decides who will see them.

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Beyond the digital divide: parents' use of artificial intelligence in contexts of social marginality

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A common presupposition suggests that technological advancements naturally broaden the horizon of accessible knowledge. However, educational history demonstrates that no innovation possesses an inherent capacity for inclusion. Every development introduces specific opportunities alongside novel modes of marginalization, as technological artifacts often progress at a speed that outpaces the ability of individuals and social groups to integrate them meaningfully. This discrepancy between technical advancement and actual cultural appropriation constitutes a primary pedagogical challenge within the contemporary landscape of artificial intelligence.

This inquiry proceeds from the premise that the accelerated rhythm of technological evolution may exacerbate the distance between individuals possessing the cultural capital to utilize AI as an educational catalyst and those inhabiting positions of social and cultural vulnerability, who may lack the necessary hermeneutic instruments to identify its pedagogical affordances. The objective of this study is to examine how parents conceptualize artificial intelligence, identifying which affordances (Gibson, 1979; Aiello & Giaconi, 2024) are recognized and the subsequent impact on their formative practices.

Artificial Intelligence in Parenting Practices in Contexts of Marginality

From a pedagogical perspective, parental responsibility is conceptualized not merely as a collection of obligations, but as a persistent relational tension (Iori, 2018) manifested within the daily complexities of family life (Caronia & Colla, 2024; Winnicott, 1993). Embracing the care of another and the capacity for self-giving involves not only the substance of the response but also its modality — characterized by the presence, attention, and significance infused into the parent-child dyad.

Analyzing the intersection of AI and parenting within marginalized frameworks is particularly relevant given the initial promises of accessibility associated with AI (Morris, 2020). Theoretically, such tools could provide significant support in environments where traditional resources are notably scarce.

Consequently, it is pertinent to investigate which affordances of artificial intelligence (Gibson, 1979; Norman, 1988; Aiello & Giaconi, 2024) are perceived and utilized by parents facing sociocultural disadvantages. Adopting a phenomenological lens (Merleau-Ponty, 2003; Husserl, 1913; Bertolini, 2001), these action possibilities are not intrinsic to the artifact but arise through the dialogue between material properties and the user's subjective agency.

In accordance with contemporary scholarship (Klapow et al., 2024), the affordances recognized by parents are primarily directed toward sustaining their educational role. This aligns with the paradigm of family resilience (Walsh, 2016), wherein AI integration serves as a supplemental resource for managing and navigating conditions of vulnerability.

Recent scholarship (Lee et al., 2025; Navarro, 2026) has further highlighted persistent biases in AI utilization among marginalized populations. This suggests that the relationship with technology is intrinsically linked to the cultural repertoires and environmental resources inherent to specific social contexts, echoing the concept of funds of knowledge (Moll et al., 1992; González et al., 2005).

Methodology

1 Aim

The current study represents the initial exploratory phase of a broader research initiative dedicated to the construction and subsequent validation of an instrument measuring parental engagement with digital technologies and artificial intelligence.

The central research question asks: What factors characterize the parental relationship with AI, and how does this correlate with their unique personal, familial, cultural, and economic landscapes?

Setting and Participants

The investigation was situated in the northern Neapolitan territory, specifically within the Quarto district of the Campi Flegrei, operating through the educational initiatives of the Cittadella dell'Inclusione (Sabatano, 2022). The participant group consisted of seventy-nine parents.

Instrument Development

Grounded in the established theoretical framework, an exploratory quantitative questionnaire was designed to investigate the correlations between socioeconomic status and technological access, perceived digital competencies, and the ability to operationalize AI affordances (Gibson, 1979) in daily caregiving. This instrument is presently in the pre-testing phase.

Administration

Utilizing a non-probability convenience sampling method, participants were identified via the Cittadella dell'Inclusione and its affiliated networks. The questionnaire was administered via a digital platform (Google Forms) for individual, anonymous completion, supported by trained educational personnel.

Data Analysis

Statistical analysis was performed utilizing IBM SPSS Statistics. Initial procedures included data cleaning, verifying coding integrity, and addressing outlier or invalid values.

Discussion and Conclusions

Preliminary findings indicate a selective and contextually mediated receptivity toward artificial intelligence. Notably, prior experience with AI does not simply increase general acceptance but fosters a specific readiness to apply these tools to routine parenting activities, even as skepticism remains high regarding high-stakes domains such as medical guidance. This underscores the necessity for AI literacy initiatives that integrate technical proficiency with critical evaluation, privacy awareness, and the preservation of professional and human judgment.

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Mentoring and strategic vision for inner areas: Experiential background for cascade teacher training

Paladino Carmela

Schools in inner areas (psnai, 2021) face complex challenges (bartolini et al., 2022; peconio, 2025): geographical isolation, educational poverty (vinci, 2023), sporadic cultural opportunities, a defeatist attitude, and school and territorial dropout. The teacher acts as a mediator (damiano, 2013; flavian, 2019) between cultural heritage and territory-oriented digital skills. The theoretical framework integrates the faro convention, snai, tpack (2006), and digcomp 3.0 (2025). The research addresses three questions: the identification of teachers inclined toward territorial educational design, the identification of technologies as devices for cultural mediation, and the relationship between ai literacy and local-oriented educational design intentionality.

The research adopts an explanatory sequential mixed-methods approach, involving n = 113 teachers (69.91% primary, 30.09% lower secondary school) through a cawi questionnaire (1-10 point likert scale). The sample was stratified into four seniority cohorts. The tech-readiness index measures the teacher's digital preparation through the arithmetic mean of evaluations on vr, ar, avatars, ai literacy, prompt engineering, and digital storytelling (validated by cronbach's alpha, $\alpha = .986$). Shapiro-wilk normality tests show an asymmetrical distribution of responses. The statistical-inferential strategy applies non-parametric estimators: the kruskal-wallis test and spearman's rank correlation coefficient (ρ). The qualitative component analyzes open-ended responses in r via an nlp pipeline featuring tokenization, lemmatization, and stop-words filtering.

Multiple linear regression confirms that the tech-readiness index significantly predicts the teacher's ability to design educational paths anchored to the territory ($\beta = 0.42$; $t = 2.70$; $p = .008$). The analysis revealed a powerful moderation effect exerted by teaching seniority (disaggregated spearman coefficients by subgroups). The impact of digital skills on co-design is conditioned by the experiential background. At the beginning of the career (<5 years of service), the correlation between technical skills and localized drive is highly significant ($\rho = .708$; $p = .001$), showing an immediate translation of skills into field-based laboratories, supported by native technological familiarity. In mid-career (6-15 years; $\rho = -.036$; $p = .814$), instrumental mastery risks becoming a sterile technicism if not supported by networks of territorial co-responsibility. The correlation reactivates among expert ($\rho = .566$; $p = .004$) and senior teachers (>25 years; $\rho = .520$; $p = .005$). Senior teachers, despite lower technical familiarity, possess the relational density, mentoring posture, and affective anchoring necessary for resilience and citizenship.

Nlp analysis of the open-ended responses identifies “territory” ($f = 54$) as the central semantic attractor. The lemmas “avatar” ($f = 37$) and “storytelling” ($f = 37$) are interconnected with clusters related to the physical and biographical space of inner communities: “city/town” ($f = 27$), “local” ($f = 18$), and “history” ($f = 19$). Inflected variants under the macro-hub “digital” ($f = 74$) demonstrate that teachers embrace technology as an invisible mediation tool to unearth and document heritage. The kruskal-wallis test highlights significant differences across cohorts in the perception of augmented reality as a relational bridge ($\chi^2(3) = 11.13$; $p = .011$). A convergent u-shaped trend emerges: values are high among newly recruited teachers and mirror-rise among expert and senior professionals, who consider the immersive medium an ideal tool to prompt students (“students”, $f = 19$) to give new meaning to the historical roots of their villages.

Global correlation analysis on the entire sample revealed a total absence of a linear link between technical ai mastery (ai literacy) and the propensity to align school subjects with local heritage ($\rho = -0.006$; $p = .949$). Isolated technical competence yields no value; educational worth is only unlocked through territorial knowledge, personal dedication, and community engagement.

Educational innovation in inner areas requires hybridizing technology with local heritage through intergenerational mentoring (agrati, 2022). Here, senior teachers' methodological expertise provides the necessary scaffolding for younger colleagues' native technical familiarity, ultimately fostering citizenship and resilience.

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Judging, Reasoning, and Deliberation: Techno-Aesthetic Pathways for Responsible Encounters with Artificial Intelligence

Pileggi Francesca

The challenge posed by Artificial Intelligence requires the development of critical-creative skills – such as self- and social-awareness, collaboration, critical thinking and creativity (CASEL, 2023; EC, 2018) – essential to navigate a reality increasingly permeated by AI. Education should foster awareness of risks – including anthropomorphisation, disinformation and algorithmic manipulation – whilst developing the ability to reshape reality through a responsible relationship with AI technologies.

This vision involves recognising the school's educational role – beyond instruction – in nurturing the cognitive, sensitive, emotional, ethical and relational dimensions of the individual (OECD, 2026). From this holistic perspective, education values the individual's uniqueness, enabling the subject to develop an «awareness of being a unique being» (Bellingreri, 2019, p. 47, my trans.) And to assume their personal responsibility for making a difference in the world.

Within this framework, the aesthetic experience represents a significant context capable of placing the individual in a sensitive (aesthetic) and immediate relationship with reality, fostering one's process of «judging, reasoning, deliberation» (Dewey, 1915/1899, p. 151) and encouraging a deeper understanding of the issues arising from everyday life (Cecchi, 2025). Among the forms such experience can take, the techno-aesthetic one (Montani, 2014; Simondon, 2017) is particularly significant from an educational perspective. Rather than merely passively engaging with technical and technological artefacts, the individual explores new possibilities for configuration by exercising one's sensitive perception and one's «interactive imagination» (Montani, 2014, p. 12; my trans.) – that is, the faculty that mediates between one's capacity for theoretical vision and one's ability to emancipate the world.

However, the techno-aesthetic experience requires intentional organisation in accordance with certain design principles.

It begins with a direct, guided and "material" (Binda, 2020) encounter with AI artefacts – including conversational agents, generative systems and humanoid robots (Garzón, Patiño & Marulanda, 2025; Panciroli, Macauda & Ferrara, 2023) – which are experienced in cooperative contexts. On the one hand, this encounter fosters the development of a personal perspective on AI through the appropriation of one's way of perceiving and interpreting such technologies, promoting a more conscious relationship with the self. On the other hand, the cooperative dimension turns the experience into a space for the sharing of feelings and the intersubjective construction of meanings. Within this context, a "holistic attitude towards perceiving with" is cultivated (Perullo, 2020, p. 142; my trans.), which fosters forms of entropy (Cappuccio, 2008), or "embodied" mutual understanding (Pinotti, 2008) that acknowledges others' experiences without erasing their differences (Gallese, 2024).

Therefore, this direct engagement with AI technologies marks the beginning of a process of critical discernment, aimed at reconstructing their origins, functioning and implications, whilst assessing risks and potential. The judgement thus formed encourages the exercise of interactive imagination, aimed at exploring new possible reconfigurations of reality by comparing alternatives. Within this dynamic involving critical thinking and creativity, an ethically founded stance is ultimately established; this translates into the formulation of non-individualistic principles but shared ones, guiding the design, implementation and use of AI for a development that respects the planet.

This process-oriented approach makes techno-aesthetic experience a privileged educational pathway through which individuals develop critical-creative skills to judge, reason and deliberate responsibly in AI scenarios, expanding their capacity to perceive, interpret and transform reality.

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Beyond the Pitch and the Screen: Affective Self-Exclusion in Sport and Digital Life among Italian Pre-Adolescents

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Italian schooling has, for half a century, guaranteed that every child sits in the ordinary classroom. Yet presence is not participation. A child can be enrolled, seated and counted, and still withdraw — from the game in the gym, from the group photograph, from the chat where everyone else is talking. This contribution concerns that second kind of absence: the one that leaves no trace in the attendance register because the child is physically there, and the one that inclusive pedagogy is least equipped to read when it wears the mask of choice.

We bring together two domains rarely studied as one. The first is organised sport, where drop-out among children is well documented and where perceived competence recurs as a stubborn driver: children leave, in large part, because they come to feel they are not good enough. Self-determination theory sharpens this, tracing withdrawal to the frustration of the basic needs for competence and, crucially, relatedness. The second is the digital social environment, where a parallel withdrawal appears in a different vocabulary: the editing of one's own face before it can be seen, and the small daily refusals to appear at all. Our claim is that the two share a common affective grammar rooted in perceived inadequacy.

The study draws on the Italian project Non Fermateci. A qualitatively-driven convergent mixed-methods design pairs a large survey of pupils aged 8-13 with two focus groups in a primary school. Of 8,933 returned questionnaires, 6,783 met the validity criteria and form the analytic sample; the self-exclusion items, routed by practice status, were answered by between 531 and 793 children. The qualitative strand was generated in two fifth-grade classes, some forty-five pupils, and analysed through reflexive thematic analysis. Because the gender axis of this dataset has already been published, gender does not enter the analysis; the retained axes are age, school level, household size, study time and the family's relationship to sport. Integration happens at the level of interpretation, not estimation: we offer a structural parallel, not a statistical bridge.

On the survey side, an affective judgement of inadequacy is the most widely shared account children give of disengagement. "I did not feel cut out for the sport I had chosen" is endorsed, fully or in part, by 52.8% of drop-outs; the relational-involvement deficit (insufficient involvement by coach or teammates) by 52.0%; and, among children who never took up sport, "I do not feel cut out for it" by 49.2%. Roughly half of the disengaged, in every form, name a felt verdict of inadequacy.

The more telling result is what this driver is not associated with. Across fifteen cross-tabulations against the non-gender axes, thirteen returned no significant association, with negligible effect sizes (Cramér's V between 0.005 and 0.07). The felt sense of not being cut out is reported at much the same rate by eight- and thirteen-year-olds, across school levels, household sizes and study loads. A driver named by half the children yet predicted by none of their circumstances is an unlikely candidate for something the child simply brings to the setting; it is far more plausibly something the setting does, fairly evenly, to whatever kind of child she is. The numbers quietly close off the explanation a tired pedagogy reaches for first — that some pupils are just less motivated — and turn attention back to the relation and the climate.

This is where the survey hands over to the focus groups, where the same grammar reappears in the digital register through four movements. The first is withdrawal from one's own image: children decline to be seen, not for legal privacy but out of not liking themselves or fearing others' judgement, preferring images in which they can barely be recognised. The second is repair: filters serve to make the self admissible before it is allowed to be seen — the same labour as choosing not to appear,

conducted with different tools. The third is silence: in both classes a few children carried the discussion while others stayed at its edge or said nothing, and where non-participation coincided with an unrecognised special educational need, affective self-exclusion was not a metaphor but a visible behaviour. The fourth complicates any picture of passivity: several children showed real critical awareness, setting limits and protecting themselves, which warns against reading every withdrawal as a wound.

Two contributions follow. Substantively, sport drop-out and digital withdrawal are better read as two surfacings of one affective grammar of perceived inadequacy than as the separate problems their literatures have made of them. Disciplinarily, this grammar is relationally produced rather than individually owned: what teachers record as motivational deficit is frequently the surface of an inclusion failure, and — most tentatively, and most importantly for special pedagogy — affective self-exclusion may be a visible behavioural trace of educational needs the school has never named. None of this is offered as measurement. The convergence is a recognition, the special-needs signal an observation awaiting instrumentation. What the study delivers is a way of seeing, and an agenda: instrumented designs able to move the unrecognised-need signal from impression to evidence, longitudinal work following the same children across both fields, and classrooms in which affective literacy is a property of the setting rather than a competence audited in individual pupils — where a child's silence is read as a question about belonging, and the right to take part and to be seen on one's own terms is treated, on the pitch and on the screen alike, as the inclusive entitlement it already is in principle.

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Intersectional perspectives in designing empirical research. A questionnaire for exploring adolescent and youth language in the post-pandemic context

Romeo Francesco Paolo
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This contribution is situated at the intersection of Educational Sciences, Educational Linguistics, and Media Education, and addresses the transformations of adolescent and youth language in the post-pandemic context. The theoretical assumption underpinning the study is that language is not merely a tool for communication but constitutes a fundamental dimension through which individuals organize experience, construct meaning, shape their identity, and develop the capacity to envision and pursue life projects. This perspective is consistent with the framework established by the United Nations Convention on the Rights of the Child (1989), which recognizes young people's right to expression, participation, and the full development of their personality, as well as with the principles enshrined in the Italian Constitution concerning human development and participation in social life (Articles 2, 3, and 34). Within this framework, the observation of contemporary linguistic practices makes it possible to identify deeper processes related to the condition of youth and the ongoing transformations of subjectivity.

The analysis begins with the observation of a growing condition of fragility affecting adolescents and young people, a phenomenon that the pandemic has contributed to making more visible. This vulnerability is interpreted through a systemic perspective, according to which individual difficulties cannot be understood in isolation from the relational, educational, and cultural contexts in which they emerge. The phenomena observed—difficulties in establishing meaningful relationships, a declining sense of confidence in the future, a weakening of personal life planning, and an increase in self-referential and often painful forms of withdrawal—are interpreted as manifestations of developmental needs that have not been adequately recognized or addressed by the main educational and socializing agencies.

Within this framework, language assumes the role of a privileged indicator. The authors hypothesize that younger generations are experiencing a progressive decline in their ability to use language as a tool for processing experience and constructing shared meanings. Linguistic impoverishment is defined as a multidimensional phenomenon affecting lexical availability, semantic richness, syntactic complexity, and symbolic-narrative capacity simultaneously. This contribution does not endorse a declinist view of language, nor does it propose a nostalgic interpretation of ongoing changes. Rather, attention is directed toward the consequences that these transformations may have on individuals' ability to make sense of their lived experiences and to develop mature forms of reflection and self-understanding.

The present reflection is grounded in the assumption that language, thought, and identity construction are deeply interconnected and mutually constitutive processes. The growing difficulty experienced by young people in narrating their own lives, linking events and experiences within coherent interpretative frameworks, and projecting themselves into the future is interpreted as an expression of a broader crisis of meaning-making. When experience lacks adequate linguistic forms of representation, it becomes increasingly difficult to transform it into self-knowledge, existential orientation, and the capacity to develop meaningful life projects.

Particular attention is devoted to the role of digital environments. This reflection is also situated within the framework of European and national policies that increasingly recognize communicative and digital competences as essential prerequisites for active citizenship. In particular, the Council Recommendation of the European Union on Key Competences for Lifelong Learning (2018) identifies literacy competence, digital competence, and personal and social competence as fundamental dimensions for informed and

responsible participation in democratic life. The contribution highlights how social networks and online platforms have profoundly transformed young people's communicative practices, fostering forms of expression characterized by immediacy, brevity, and multimodality. These transformations are not interpreted as a direct cause of linguistic impoverishment; rather, they are understood as part of a broader process of adaptation to new communicative ecosystems. Nevertheless, the prevalence of rapid, fragmented, and highly contextualized interactions reduces opportunities to exercise more sophisticated linguistic competences, which are essential for the construction of arguments, self-narration, and critical reflection.

Within this framework, the authors observe a significant transformation in young people's lexical repertoire, which is increasingly influenced by the languages of social media, gaming, and global digital culture. This phenomenon is not interpreted in normative terms; rather, it is understood as an indicator of changing forms of cultural belonging and of the ways in which young people construct identity and gain recognition within peer groups. The growing diffusion of supra-regional and Anglicized linguistic repertoires testifies to the emergence of new processes of linguistic and symbolic socialization.

Building on these theoretical premises, the contribution presents the design of a research instrument developed from an intersectional perspective. The proposed questionnaire seeks to make empirically observable the relationships between linguistic practices, emotional experiences, digital communication practices, and identity construction. The aim is not merely to describe the characteristics of contemporary youth language, but rather to understand how transformations in language reflect broader processes of social participation, agency development, and the construction of life projects.

Overall, this contribution proposes an understanding of language as a privileged lens through which to observe the vulnerabilities and transformations affecting younger generations. Linguistic impoverishment is interpreted not as an isolated phenomenon, but as a symptom of a broader difficulty in meaning-making, in the narrative processing of experience, and in the construction of future horizons. From this perspective, empirical research assumes both an investigative and an educational function, aimed at identifying tools capable of fostering the development of the reflective, communicative, and planning competences necessary for the full social participation of young people. This approach is consistent with Goal 4 of the United Nations 2030 Agenda for Sustainable Development, the Council Recommendation on Key Competences for Lifelong Learning (2018), and the Italian national guidelines on civic education and digital citizenship introduced through Law No. 92/2019.

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From Cognitive-Affective Vulnerabilities to Digital Agency: A Pedagogical Model to Address Algorithmic Manipulation

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Several Big Tech figures have framed demands for accountability as expressions of mistrust toward innovation, recasting concerns about algorithmic manipulation as another manifestation of the fear surrounding the emergence of new technologies. This analogy obscures the distinctiveness of adaptive architectures, designed to maximise engagement by conditioning users' cognitive-affective responses and reinforcing impulsive or reactive behavioural patterns (Milli et al., 2025; Piccardi et al., 2025). From the perspective of critical pedagogy (Giroux, 1988), such rhetorical framing fallaciously redefines the terms in which the problem is understood.

This study proposes a pedagogical model centred on agency. The literature addresses important but largely separate dimensions, without integrating critical thinking, metacognition, and emotional awareness. The model reframes documented vulnerabilities as capacities to be developed through education, moving beyond exclusively normative interventions.

Algorithmic Manipulation as an Educational Problem

Algorithmic manipulation is the intentional use of adaptive systems to covertly influence users' decision-making processes (Susser et al., 2019). Drawing on interaction data, algorithms build predictive models and personalise content to maximise time spent on the platform. The opacity of the link between input and output prevents users from fully perceiving constraints on their decision-making autonomy. Unlike interpersonal manipulation, algorithmic manipulation relies on high-speed automation, large-scale deployment, continuous adaptation, and opaque decision-making processes (Yeung, 2017).

Three domains of vulnerability emerge from the literature. The first is critical-cognitive and concerns the difficulty of recognising algorithmic mediation and assessing its purposes. The second is metacognitive-regulatory and encompasses automaticity, loss of intentionality, compulsive engagement, difficulty disengaging, and impulsive or reactive modes of interaction (Tran et al., 2019). The third is emotion-regulatory and concerns the affective amplification of content, resulting in heightened negative emotions and polarisation (Milli et al., 2025; Piccardi et al., 2025). These phenomena are often treated as diagnostic indicators rather than as potential sites of educational transformation.

The Limitations of Normative Approaches

Normative interventions operate through restrictions on access and exposure. They may limit harm, but their logic is heteroregulatory: it sets the boundaries of digital experience from the outside without developing users' own capacities to resist cognitive-affective constraint. Restrictions may also provoke psychological reactance and thereby undermine the regulatory objective itself.

At the social level, the UK Online Safety Act falls within this logic of intervention and highlights its potential risks. It requires risk assessments, moderation, the removal of illegal content, and age assurance, backed by powers to impose penalties and block services. Its effectiveness rests on the assumptions that procedural controls and identity verification can produce safety without generating censorship or privacy violations, and that hate speech can be defined in law without curtailing freedom of expression (ARTICLE 19, 2021).

A Pedagogical Approach to Address Algorithmic Manipulation

This model translates the three vulnerabilities into educational objectives. Deficits in understanding are addressed at the critical-cognitive level: users learn to recognise algorithmic mediation, distinguish displayed content from the criteria governing its selection, and assess the economic and

behavioural purposes embedded in those criteria. Studies of algorithm-awareness interventions show that this understanding can be strengthened (Theophilou et al., 2023).
Loss of intentionality is addressed at the metacognitive-regulatory level, which directs attention specifically to users' initial purpose, the distribution of attention, time spent on the platform, recurring automatisms, and difficulty disengaging. Advance goal-setting and self-monitoring can increase perceived control and reduce distracted use (Throuvala et al., 2020). Its function is not to impose a reduction in time spent online, but to make the divergence between intention and behaviour visible.
Affective amplification is addressed at the emotion-regulation level: users learn to identify their emotional state, recognise its intensification during interaction, and suspend an immediate response to assess whether it is consistent with their personal aims and values. Affective social media literacy interventions indicate benefits for emotional regulation (Schreurs & Vandenbosch, 2026).
The three levels are integrated through four stages: recognising algorithmic mediation; monitoring cognitive, behavioural, and emotional responses; reflectively evaluating the interaction; and redirecting action (Fig. 1). Users identify algorithmic selection and notice departures from their initial purpose. They then assess their responses against consciously pursued aims and decide whether to modify or end the interaction.

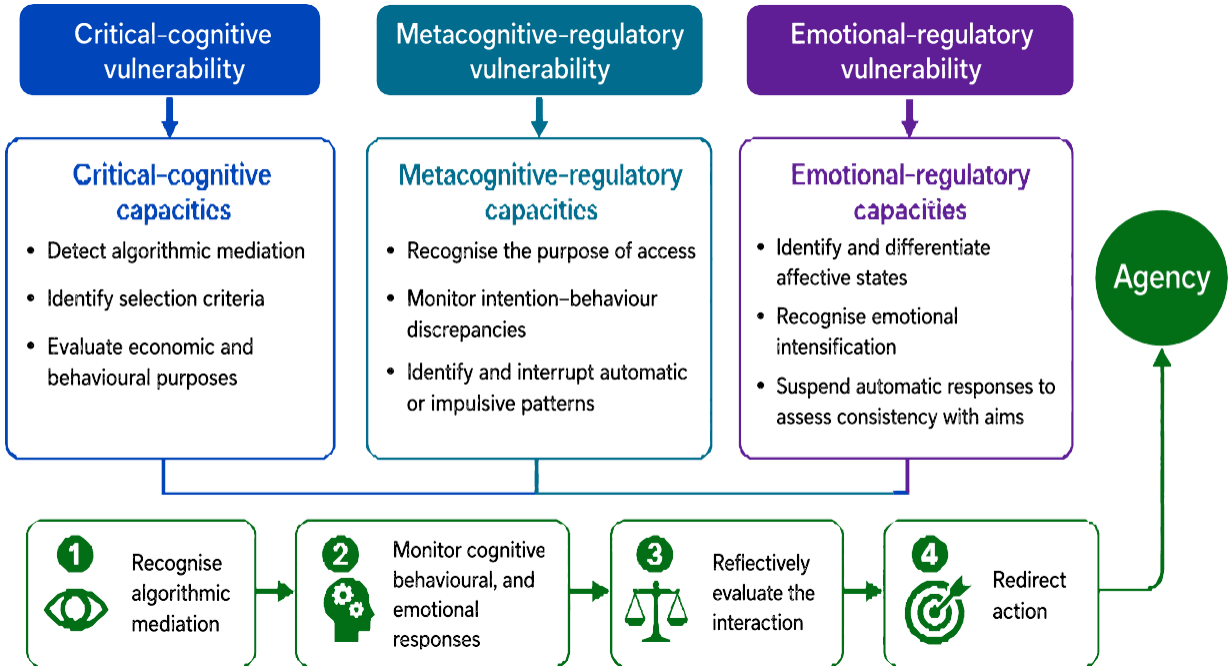


Fig. 1. Pedagogical model: from vulnerability to agency.

Responses to algorithmic manipulation cannot be confined to the external control of digital experience. Regulatory measures may contain harm, but they do not alter the processes that make users vulnerable. This model instead brings together critical understanding, metacognitive regulation, and emotional awareness. Areas of vulnerability thus become sites of pedagogical transformation, thereby enabling users to evaluate and redirect the interaction.

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From Pedagogical Mediation to Algorithmic Presence: Generative AI and the Transformation of the Educational Relationship

Russo Giuseppe
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In the contemporary landscape, an epistemological and educational crisis is becoming increasingly apparent, affecting the ways in which knowledge is produced and legitimised (Quattrociocchi, 2023). Learning is gradually moving away from the notion of a slow, dialogical process based on the accumulation of experience, and is taking on the characteristics of rapid, performance-oriented acquisition (Allouche, 2024). The educational relationship is also affected by this transformation, as the links that have long ensured consistency in educational processes are becoming weaker (Lingua & Zamengo, 2025). The erosion of mediation processes diminishes recognition of their value in the construction of knowledge and the formation of the individual. The authority of teachers and experts is facing a crisis of legitimacy, whilst algorithmic systems are increasingly perceived as reliable and impartial sources of knowledge. Similar dynamics are also at play in the realm of relationships and emotions. Among adolescents, there is a growing tendency to turn to chatbots and AI companions as their preferred conversation partners, sometimes as a substitute for the usual practices of interacting with others (Fang et al., 2025).

In this regard, some noteworthy findings have emerged from a recent exploratory survey carried out as part of the research project 'Paideia/Bildung/Ausbildung per il XXI secolo. La formazione come sfida per l'inclusione in terra Ionica', coordinated by Professor Adriana Schiedi of the Jonico Department at the University of Bari Aldo Moro. As part of this project, the survey entitled 'Esposizione agli schermi e alle AI', conducted by Professor Schiedi herself, with the collaboration and support of Luigi Felaco, aimed to investigate adolescents' screen time, how they use AI, and students' perceptions of the role of the teacher and artificial intelligence in learning processes. The analysis, conducted using a survey with a quantitative approach, involved 86 students aged between 17 and 18 enrolled at the I.I.S.S. Quinto Orazio Flacco in Palagiano (TA). The preliminary results of the survey show, first and foremost, a limited understanding of digital phenomena, with only 45.9 % of respondents correctly defining artificial intelligence. In terms of daily habits, there is a high level of screen time. 33.8% of adolescents spend at least four hours a day in front of a digital device and over 8% spend more than seven hours, whilst 44.2% are unable to estimate their screen time. Screen use also appears to be significant in schools. Around half of pupils report minimal screen time during lessons, 8.1% say they spend the entire lesson in front of digital devices, and around a quarter of the sample report screen time of between fifteen and thirty minutes per lesson. All respondents also stated that they use AI-based tools, with one in four teenagers using them every day and 82.6% using them at least once a week. 77.9% of the sample use them mainly for educational purposes, particularly to obtain explanations, summaries and support with their homework. The data show that artificial intelligence is an integral part of Generation Z's everyday experience, with a very high level of confidence in these technologies. Approximately 94.2% of students rate their reliability as ranging from average to above average, and over 80% believe that these tools can facilitate their understanding of concepts to the same extent as or more than a teacher's explanation alone. None of the respondents prefer a virtual teacher to a real one, but 3.5% would like learning to be primarily driven by artificial intelligence, with only limited support from the teacher. The majority, however, favour a hybrid model based on collaboration between teachers and generative tools, whilst 19.8% express a preference for an educational environment free of AI. As for AI companions, a third of teenagers say they have never shared personal problems with them. Around 65% have used these systems at least once to ask for advice or seek emotional comfort, and 7% use them regularly. The data suggest that artificial intelligence continues to be perceived primarily as a support tool and that

educational responsibility remains, at least for now, with adults and teachers. However, there are signs that call for caution. For 10% of respondents, AI companions are their main source of emotional support, and none of them identify the teacher as a point of reference in times of personal difficulty. The data collected, whilst putting alarmist interpretations into perspective, highlight the need to rethink educational models and to strengthen the roles of support, active listening and guidance played by educational professionals, so that the relationship with generative technologies develops from a critical perspective without compromising the role of human mediation in interpreting reality and constructing frameworks of meaning.

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The invisible teacher: Algorithms, emotions, and the construction of the Self in digital cultures

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Today, social networks seem to allow greater freedom in self-representation and in the selection of content to follow, enabling forms of self-expression and empowerment (Bocci et al., 2023). The social media user is a prosumer (Toffler, 1987), actively participating in the selection of content and deciding what, when, and how to consume. Consumption is increasingly shifting toward online platforms that offer personalized content and create aesthetic, ethical, and cultural models of reference. Recommender systems shape user experience by influencing what people interact with, often reinforcing biases that harm marginalized individuals and communities (Baeza-Yates, 2018; Bocci et al., 2023). A feed that predominantly presents white, heterosexual, cisgender male bodies that conform to dominant beauty standards and display wealth risks constructing this imagery as the only desirable ideal. Conversely, those who do not fit into these categories, or who do not recognize themselves—within their own individual complexity—in such representations, are left with little space. Social media and trap culture contribute to the construction of a toxic image of masculinity by offering highly performative and often rigid identity models. Within digital contexts, communities emerge that reinforce visions based on competition, dominance, and the rejection of vulnerability, as highlighted by Ciccone (2019), who analyzes contemporary transformations of masculinity and their developments in online environments. At the same time, trap music promotes an aesthetic centered on power, material success, and control, often accompanied by sexist language and violent representations of relationships, as shown by analyses of contemporary music (Hobbs & Gallupe, 2019). In ethnopedagogy, performance is the way we manage the impressions we give to others; it is a continuous act divided between how we appear in public and in the private backstage, where we desperately try to seem normal and successful. The essay "Ethnopedagogy of Toxic Consumption" (Palmisano, Toto, 2026) describes how, in youth subcultures such as trap, this performative anxiety reaches its peak. The use of substances and ostentation become stage tools to mask fragility, constructing an identity of strength in a world of precarity. The paradox is that the more trap artists display their emotional vulnerability as a form of authenticity, the more this very confusion becomes yet another inauthentic performance to be consumed. We have never been so connected, and yet never so anxious about our role on stage. Rather than establishing direct causality, it is important to observe their interaction: music provides narratives, while social media amplifies them into models to imitate. Hegemonic masculinity is constructed through practices that reward strength, competition, and control, discouraging vulnerability (Connell, 2005). As a result, male identity is often defined in opposition to emotionality, producing a fragile yet hyper-performative masculinity. Without emotional education, individuals risk being overwhelmed by their emotions (Matarazzo & Zammuner, 2015). When only violent emotions are socially permitted, this can lead to aggressive behaviors. This dynamic affects everyone, but particularly men, due to gendered socialization (Connell, 2005). Even when individuals recognize the need for help, norms of self-reliance discourage seeking support (Addis & Mahalik, 2003). Toxic masculinity, therefore, refers not to men themselves, but to the expectations imposed on them: being strong, dominant, and never vulnerable (Facheris, 2025). In a capitalist context, where urban space is increasingly regulated and homogenized, and limiting alternative forms of expression, graffiti and street art allow marginalized groups to reclaim visibility and challenge dominant cultural narratives. Despite pressures from institutions and markets, counter-hegemonic discourses (Gramsci, 2014) have kept graffiti alive as a global cultural phenomenon (Evans, 2025). As Lachmann (1988) noted, "Graffiti in some forms can challenge hegemony by drawing on particular experiences and customs of their communities, ethnic groups, and age cohorts, thereby demonstrating that social life can be constructed in ways different

from dominant conceptions of reality". It is therefore possible to create a counter-hegemonic narrative that presents models of deconstruction, inclusion, and participation, capable of initiating processes of collective and community-based education. "The political, in the Greek sense, is thus centered on freedom: a freedom understood negatively as not being dominated and not dominating, and positively as a space that can be created only by many and within which each moves among equals. Without these others, who are my equals, freedom does not exist; for this reason, whoever dominates others, and is therefore by principle different from them, may be happier and more enviable than those they dominate, but is by no means freer. They too move within a space where freedom does not exist. This is difficult for us to understand, since we associate equality with the concept of justice rather than with that of freedom, and thus interpret the Greek term for a free constitution, isonomia, according to our idea of equality before the law. But isonomia does not mean that all are equal before the law, nor that the law is the same for everyone; it simply means that all have an equal right to political activity, which in the polis was primarily a dialogical activity" (Arendt, 1995).

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Affective Education and the Pedagogy of Desire for Teacher Training in the Digital Affective Era

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In today's educational landscape, deeply marked by the neoliberal logic of performance and an obsession with digital self-promotion, a structural pedagogical crisis is becoming increasingly evident. Schools, traditionally understood as symbolic places of encounter, mediation and the transmission of values, now face a radical challenge: to rethink themselves, their tools and their languages in order to respond to profoundly changed educational needs.
It is against this backdrop that our reflection begins, with a question intended to run through the entire discussion proposed here like a common thread: is it really possible that human beings – and, with them, educators – could be replaced by artificial intelligence in the emotional and educational spheres? And, above all, what human characteristic will no digital algorithm ever be able to replicate?
The starting point for this analysis is a description of a twofold crisis affecting the contemporary world. On the one hand, we are witnessing increasingly widespread phenomena of senseless violence, rampant vulgarity, incidents of bullying filmed and shared online, and a dismissive attitude towards educational institutions. On the other hand, a quieter but equally devastating form of inner impoverishment is manifesting itself: what the author defines as a veritable spiritual anorexia of desire, that is, a progressive loss of vital meaning, a waning of epistemic desire, and an increasingly marked detachment from a love of learning and knowledge.
These two manifestations are not separate phenomena, but feed off one another within what is described here as a 'mucilaginous' society: a social system incapable of integrating its own components, which tends to foster processes of desublimation and leaves adolescents and young people in a state of profound emotional loneliness. It is from this diagnosis that the central pedagogical proposal of our contribution takes shape: a Pedagogy of Desire, conceived as a systematic and structured response to the crisis, beginning with teacher training.
The Pedagogy of Desire is structured as a journey designed to help individuals understand and recognise the nature of their own desires, to counter the alienating temptations of contemporary life, to promote critical thinking, to develop relational ethics, and to cultivate affectivity and emotional intelligence as fundamental dimensions of human existence. Starting with the cognitive nature based on kantian transcendental structure of reason, then moving to its characteristic as the conception of Representation of Bowlby's Internal working models and going to its nature as the Seeking -the main emotional system of neuroscientific field-, this Pedagogy interprets desire as a human force that drives the whole person throughout life: therefore there is a need to knowing it within different hermeneutics and understand its power to be the orienting ideal of human being; in this conception lies the possibility to educate the desire faculty within the teacher education of our contemporary era, which is also a dymension of every human being that cannot be replaced by any algoritm: desire and affection in the digital era are still –paraphrasing Nietzsche- "human, too human".

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Educational Pathways Aimed at Developing Students' Critical Thinking and Emotional Awareness in Relation to Algorithmic Manipulation and Social Media

Tenerelli Nicola

Digital technology has become an integral part of everyday life (ISTAT 2026), but initially it was seen only as an economic and professional accelerator. It is a powerful tool for cognitive, relational, and value transformation that requires critical digitalization. Past governments, pursuing a democratic but low-cost school system, have instead accentuated social inequalities.

Ricolfi and Mastrocola (2021) emphasize that only a demanding and selective school system can raise the cultural level of young people, fostering intellectual autonomy and a true democratic consciousness.

Since the Second Republic, Italian politics has used personalized communication techniques that appeal to citizens' emotions rather than reason. Post-truth does not deny reality, but creates a private and group truth, validated by likes. Social media collects behavioural data to profile users and bombard them with content that confirms prejudices, exaggerates positions, and creates emotional dependence. This results in a hybrid space (physical-digital) and digital communities of practice (Riva, 2018) that amplify ideas through likes and shares. Peters and Jandric (2019) warn of systemic risks (social, political, ecological). Digital technology fragments the necessary homogeneity of values in a society, distancing citizens across different value platforms.

Chomsky denounces the paradox: democratic tools and discourses produce less real democracy (Robichaud, 2013). Schools should train critical thinkers and ethical people, but today they primarily promote economic success and competition. There is unanimous condemnation of multiple-choice tests that undermine individuality, which Canfora calls quizology.

Spitzer speaks of digital dementia: the excessive use of external devices reduces internal mental activity (hippocampus), weakening the ability to learn. Traditional education protects intellectual autonomy (Coralli, 2018).

With the distinction between true and false, fake news, information bubbles, artificial intelligence, and deepfakes, it becomes difficult to distinguish between reality and representation.

Fake news creates an inseparable mix of true and false, transcending traditional Aristotelian binary logic. Trump's communication model has replaced predictability with kaleidoscopic chaos, making rational dialogue impossible. This is how communication bubbles are born (Pariser, 2011): algorithms display similar content, confirming beliefs and creating self-referential communities. We are moving from the global village to the tribal village (Tenerelli, 2025).

The counterbody (Han, 2021) is missing, that is, the real dialogic conflict that fosters growth. citizenship bubbles are formed: groups with fanatical, closed, and self-referential participation that reject encounters with others and fuel incommunicability.

After interviewing 105 high school teachers, 93 said they were absolutely certain they were not in a citizenship bubble! First, teachers must possess a high level of critical digital skills; second, schools must provide intellectual self-defense techniques (media literacy, fact-checking, recognizing fake news, and algorithm awareness) to the students.

In summary:

- train teachers as pedagogical supervisors capable of fact-checking and reflecting on their own potential information bubbles;
- retain the humanities and the study of history;
- avoid uncritical digitalization that turns students into web-workers;
- teach the hard work of knowledge (library, laboratories, interaction with others);
- promote the right/duty to disconnect and recognize nomophobia.

Young citizens must be educated in the Aristotelian sense of the term (ζῷον πολιτικόν). School, the cornerstone of democracy, must counter the contemporary illusion that success is achieved effortlessly: as Calabresi (2025) reminds us, effort, understood as dedication, perseverance, and tenacity, is essential for growth. Investing in school is the only strategic choice for democracy and social cohesion against fragmentation and post-truth.

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Emotions under algorithms: SEL didactic pathways for Digital Affective Literacy and Algorithmic Citizenship

Valentino Giuseppe

Digital competence no longer coincides with the technical use of devices, applications and information sources (Pangrazio, 2014). Platforms intervene on attention, visibility, relationships and emotions: personalized feeds, notifications, approval metrics and viral content select what appears relevant and make certain reactions more likely (Bucher, 2016; Gillespie, 2014). For adolescents, engaged in the construction of identity and the search for recognition, these dynamics can intensify anxiety, waiting, comparison, envy and fear of exclusion. Digital affective literacy therefore aims to make the emotional scripts embedded in interfaces readable, without representing users as passive or algorithms as omnipotent.

The SEL as the foundation of critical digital citizenship

Social and Emotional Learning offers a useful basis for interpreting the platform experience (Jagers et al., 2019; Mahoney et al., 2021). Self-awareness helps to recognize the signals that activate the need for confirmation or discomfort; self-management supports the interruption of impulsive responses; social awareness allows us to read inequalities of visibility, stereotypes and information bubbles; relational skills concern communication in groups and chats; Responsible decision-making guides the choices of sharing, commenting, reporting and care. SEL should not be reduced to training in individual adaptation: it allows well-being to be linked to the social and technical conditions within which people act.

The affective architectures of algorithms

Algorithms are not mere sorting tools (Bucher, 2016; Couldry, Mejias, 2019). They constitute sociotechnical architectures that establish priorities, rhythms of exposure and visibility criteria. Platforms derive value from attention and therefore tend to favor content capable of arousing surprise, indignation, desire or fear. In younger people, the continuous measurement of approval can match visibility with personal value. Echo chambers and repeated recommendations can also narrow the horizon of opinions perceived as normal, amplifying polarization and hostility. Education must therefore analyze not only what a piece of content affirms, but also why it is shown, what interests it supports and what relationships it fosters.

Affective algorithmic citizenship

Affective algorithmic citizenship indicates the ability to inhabit digital environments by recognizing their conditions of power, data economies and emotional effects. Every seemingly minimal gesture, liking, forwarding, commenting, ignoring or reporting, contributes to the circulation of content and its algorithmic evaluation. Well-being is therefore not only a private matter, entrusted to self-control, but an issue of collective responsibility (Couldry, Mejias, 2019). Educating for citizenship means helping young people to demand transparency, to counter exclusion, to build counter-narratives and to imagine digital spaces in which visibility does not depend exclusively on the intensity of engagement.

A pedagogical model between SEL and algorithmic literacy

The proposed model relates the skills of SEL with the daily practices of the platforms. Notifications, likes, influencer culture and recommendation systems become opportunities to observe the emotions and identity models that make them desirable. Infinite scrolling, autoplay and personalized feeds require attention education based on friction strategies: pauses, limits, silencing warnings and deliberate choice of connection times. Memes, viral language and commentary allow stereotypes, inclusion and conflict to be discussed. Finally, the evaluation of viral content, dubious news and materials generated by artificial intelligence develops an ethical responsibility towards the effects of digital circulation.

Didactic SEL pathways

A first path involves the mapping of the emotional scripts of the feed: through short diaries, general categories and anonymized materials, students observe which content arouses curiosity, anxiety, indignation, envy or a desire for recognition. The discussion links these emotions to the logic of recommendation and capture of attention. A second path develops counter-practices of care through case analysis, role play and the definition of strategies against hate speech, shaming and exclusion: private support, de-escalation, witness intervention and responsible reporting. A third path uses affective diaries and deliberative circles to transform immediate reactions to misinformation, polarization or idealized content into opportunities for analysis, argumentation and mutual listening.

Conclusion

Integrating social-emotional learning and algorithmic literacy allows us to go beyond media literacy focused only on verifying sources (Pangrazio, 2014; Mahoney et al., 2021). It is necessary to understand how content is selected, what emotions it activates and how it influences self-images and relationship practices. School can make emotions an object of critical knowledge, transforming fear, indignation, envy or desire for approval into signals to be interpreted. Digital affective literacy thus offers tools to defend cognitive and emotional autonomy, practice the care of relationships and participate with greater awareness in the construction of common digital spaces.

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Topic 6

Teacher Education Between the “Frankenstein Complex” and the D-Generation

Beyond Technical Expertise: ARISE-AI as an Adaptive, Responsive and Socio-Educational Framework for Understanding Teachers' Relationship with Artificial Intelligence

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The introduction of AI into social and educational contexts is not merely a technological issue, but a transformation that affects governance, professional practices and educational relationships (Accoto, 2024). Within this context, the article draws on the TEACH-AI project (Transformative Educational Approaches for Civic and Human-centred AI) conducted by the CREDDI research group at eCampus University, which involved over 5,000 Italian teachers and socio-educational professionals and led to the development of the ARISE-AI framework, Adaptive Responsive Integrated Socio-Educational Artificial Intelligence (Adamoli et al., 2026a, 2026b). The present study focuses on support teachers, exploring how they perceive and use AI in inclusive educational practices. To investigate these dimensions, the PAIR-S instruments (Adamoli et al., 2026a) was developed for and school contexts, drawing on UNESCO's AI Competency Framework for Teachers (Miao & Cukurova, 2024) and the MIM Guidelines (2025). The ARISE-AI framework reinterprets three constructs to analyse teachers' engagement with AI; affordance-in-practice (Costa, 2018) examines how teachers activate AI's possibilities in situated tasks; capability (Nussbaum, 2011) captures teachers' ability toI use AI meaningfully, critically and pedagogically; sentiment (Liu, 2012) explores the emotional orientations that shape adoption.

Findings

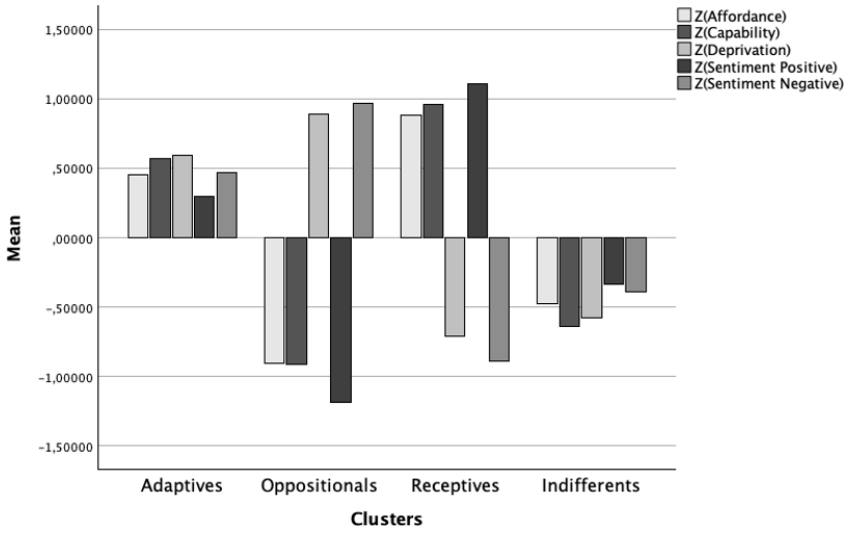
The questionnaire was administered anonymously via QuestionPro during a national training course for support teachers.

The sample included 1,034 teachers from across Italy, mainly non-tenured support teachers, with a mean age of 49 years and an average teaching experience of 8.33 years. Participants worked across all school levels, with the largest share employed in primary schools, and were distributed across Northern, Central, and Southern Italy and the Islands.

Participants reported a moderate average use of AI in daily life, with high variability, suggesting heterogeneous experiences and different forms of interaction with AI. In terms of affordance-in-practice, the highest scores concerned uses aligned with the MIM Guidelines, especially the identification and creation of interactive teaching tools, the personalisation of teaching materials and text translation. These findings suggest that AI is currently used mainly as operational support, although it holds potential for more strategic and innovative practices.

A k-means cluster analysis on the standardised dimensions of affordance-in-practice, capability, deprivation and sentiment identified a stable and interpretable four-cluster solution (Figure 1).

FIG. 1. Cluster analysis - profile plot



Discussion and implications

The study highlights differentiated profiles of Italian support teachers in relation to AI use in education. Cluster analysis identified four groups. The Adaptives (cluster 1) show medium-high affordance-in-practice and capability, combined with ambivalent attitudes: they use AI in situated ways, especially for personalisation and inclusive resources, but remain vulnerable to unclear institutional frameworks. The Oppositionals (cluster 2) report low affordance and capability, negative sentiment and high deprivation; their limited engagement reflects a critical stance toward innovation lacking training and ethical safeguards. The Receptives (cluster 3) represent the most proactive profile, with high affordance, strong capability, positive sentiment and low deprivation, acting as potential innovators in AI-supported teaching. The Indifferents (cluster 4) show low emotional and professional involvement, perceiving AI as largely irrelevant to their role. Overall, AI is still mainly used for basic operational tasks, while more strategic applications remain underdeveloped. This confirms the need for continuous training, AI literacy and shared institutional policies, in line with the MIM Guidelines and recent AI competency frameworks (Miao & Cukurova, 2024).

AI emerges as a potential amplifier of capabilities and opportunities, but its educational legitimacy depends on its capacity to preserve expressive richness, privacy and relational quality, requiring governance models that equip teachers with technical, critical and pedagogical competences in line with the Ministerial Guidelines and a perspective of rights and social justice (Buccella, 2023). However, the findings should be read as exploratory, given the limits of cluster analysis, the interpretative role of the researcher, the exclusive focus on support teachers and the use of self-reported data; future research should therefore integrate qualitative methods, examine socio-demographic and professional variables, and compare different educational systems (Adamoli et al., 2026b).

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Opportunities and risks of AI in lesson planning: insights from pre-service teachers

Agrati Laura Sara
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This contribution presents an exploratory study on pre-service teachers' perceptions of the use of artificial intelligence (AI) tools in lesson planning, with a focus on opportunities, risks, and conditions for effective integration into instructional design.

The study is grounded in the TPACK framework (Mishra & Koehler, 2006) and its extension Intelligent-TPACK (Celik, 2023), which incorporates an explicit ethical dimension into teachers' technological and pedagogical knowledge. Within this perspective, AI tools such as chatbots, intelligent tutoring systems, and automated planning systems are not neutral instruments but socio-technical systems that require critical evaluation in terms of transparency, fairness, and accountability. The theoretical approach adopted here is further informed by critical AI literacy perspectives, which emphasise the need for teachers to develop not only operational competence but also the ability to interrogate the assumptions and biases embedded in algorithmic outputs. In this sense, lesson plans generated or supported by AI are interpreted as pedagogical artefacts that can reveal how pre-service teachers negotiate between technological suggestions and professional judgement.

Methodologically, the study adopts a critical phenomenological design and is embedded in a wider international research project involving multiple countries. The Italian component is based on a sample of 237 pre-service teachers enrolled in a secondary school teacher education programme. Data were collected through a questionnaire including both closed and open-ended questions focused on prior experience with lesson planning and perceptions of AI-supported instructional design. The qualitative data were analysed through a three-stage coding process (Creswell, 2013), allowing the identification of recurrent categories and interpretative patterns. The analysis focused on perceived usefulness of AI tools, their perceived ability to respond to learning objectives and student needs, and the conditions considered necessary for their effective adoption in educational practice.

The results indicate a generally positive attitude towards AI in lesson planning. Most participants perceive AI as a useful support tool capable of improving efficiency in instructional design, reducing workload, and fostering creativity in lesson preparation. AI is also seen as potentially beneficial for adapting teaching materials to heterogeneous classrooms and supporting differentiated instruction. However, this positive evaluation is systematically accompanied by a strong emphasis on the need for teacher oversight. Participants consistently underline that AI-generated lesson plans cannot be used without revision, as they may contain inaccuracies, lack contextual sensitivity, or fail to fully capture the complexity of classroom dynamics. For this reason, AI is predominantly conceptualised as a complementary resource rather than a replacement for teacher expertise.

In conclusion, this study highlights the need to strengthen teacher education programmes by integrating critical approaches to AI in instructional design. Preparing future teachers to work with AI involves developing the capacity to assess the quality of algorithmic outputs, to understand their limitations, and to make informed pedagogical decisions. Further research is needed to examine how these perceptions translate into actual classroom practices and how engagement with AI tools influences the development of professional competence over time.

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Teaching in the Age of Artificial Intelligence: Between Paradigm Shift and the "Frankenstein Complex" in Educational Practices

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This contribution presents a systematic bibliographic review of studies published between 2015 and 2025 regarding artificial intelligence in education, focusing on teachers pedagogical practices, professional agency, and ethical decision-making. The analysis is framed using the Kuhnian concept of a paradigm shift alongside the Frankenstein complex, understood as the anxiety generated when a human creation appears to exceed or escape the original intentions of its creator. In educational contexts, artificial intelligence supports lesson planning, content generation, adaptive tutoring, learning analytics, assessment, and simulation-based learning.

These capabilities promise increased efficiency, enhanced personalization, and broader access to learning opportunities (Kasneci et al., 2023; Unesco, 2024; Zawacki-Richter et al., 2019). Yet, their pedagogical value is not intrinsic. Generative systems can help teachers draft materials, but their outputs require rigorous verification and contextual adaptation (Selwyn, 2021). Adaptive platforms may support individualized pathways, but they can narrow educational opportunities when personalization relies solely on limited performance indicators (Biesta, 2020; Tzimas & Demetriadis, 2021).

The central question is not whether artificial intelligence should be used, but under what pedagogical and ethical conditions it becomes meaningful. Teacher agency is decisive, referring to the capacity to act purposefully within material and institutional constraints (Biesta & Tedder, 2007). Teachers resistance should not be reduced to technophobia; it expresses profound professional discernment regarding trust, transparency, algorithmic bias, and the risk of delegating educational judgment to opaque systems (Nazaretsky et al., 2022; Rohl, 2025).

The tool ecosystem includes generative systems, learning platforms, and analytics dashboards. Generative tools are flexible for ideation but weak in verification, while analytics capture only what is measurable and cannot replace educational interpretation (Unesco, 2024; Williamson, 2021). Ethical challenges are central, as data-driven systems rely on large quantities of student data, raising issues of consent and institutional responsibility. Bias is significant, because algorithms may reproduce inequalities linked to socioeconomic status, gender, or cultural background (Cukurova, 2025). Without transparent governance, artificial intelligence may intensify standardization and weaken democratic values (Selwyn, 2021).

The Italian pedagogical tradition on didactic planning strengthens this argument. Educational design is a reflective process in which objectives, methods, and outcomes must be coherently aligned. This is relevant because digital systems can generate content without guaranteeing educational meaning (Notti, Marzano, & Tammaro, 2011; Tammaro, 2011). Recent Italian studies show the debate on artificial intelligence is expanding, requiring stronger integration between technological innovation and educational theory (Bevilacqua & Fiorucci, 2024; Ferrantino & Tiso, 2025). Comprehensive professional development is indispensable. Structured professional learning increases trust when it makes technologies transparent and supports shared criteria for acceptable use (Mouta et al., 2025). Innovation becomes educationally meaningful when it strengthens, rather than replaces, the reflective intelligence of teachers.

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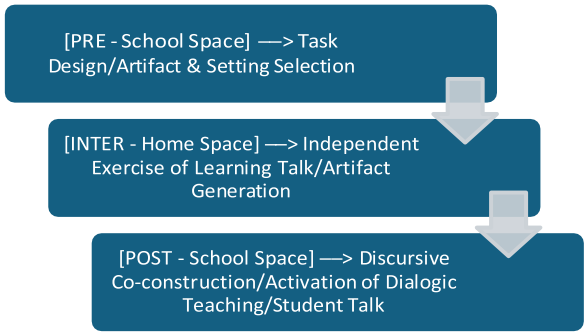
Rethinking homework between dialogic space and instructional design

Bocchi Barbara

Homework remains one of the most debated issues in contemporary educational research. Although traditionally regarded as a natural extension of classroom learning, its educational value has increasingly been questioned, particularly in primary education (cooper, 1989). Empirical evidence suggests that homework has only limited effects on academic achievement while often generating unintended consequences, including increased family involvement, unequal learning opportunities, and additional emotional pressure on children (hattie, 2009; montalbetti & lisimberti, 2020). These findings shift the focus from the quantity of homework assigned to the quality of its instructional design.

This paper argues that homework should be understood not as an isolated after-school activity but as an instructional design device connecting classroom learning with students' everyday experiences. From this perspective, homework becomes the pedagogical interface through which teachers intentionally shape subsequent learning opportunities. The proposed framework draws on robin alexander's theory of dialogic teaching (2017; 2020), which identifies classroom dialogue as the primary mechanism through which knowledge is collaboratively constructed. While previous studies have mainly investigated dialogue as an interaction occurring within classroom lessons, this study assumes that the quality of classroom dialogue is largely determined by the epistemic characteristics of the homework task designed beforehand.

To conceptualise this process, the paper introduces the task-mediated design episode (tmde) as a process-oriented, cross-contextual, and multimodal unit of analysis. The tmde integrates three interconnected phases: pre, in which teachers design meaningful learning tasks; inter, during which students independently engage with the assignment in their home environment and produce cognitive artefacts; and post, where these artefacts become the starting point for classroom discussion and collective knowledge construction. Rather than viewing homework and classroom instruction as separate educational moments, the tmde conceptualises them as complementary components of a single instructional process.



The study adopts the methodological framework of quantitative ethnography (shaffer, 2017), combining qualitative analysis with computational methods to investigate the relationship between homework design and classroom interaction. The dataset includes teachers' homework prompts, students' written and multimodal artefacts, and verbatim transcripts of homework review sessions. Tmdes were segmented into opening, development, and closing phases and subsequently coded according to alexander's five dialogic principles: collectivity, reciprocity, supportiveness, cumulativity, and purposefulness.

The findings reveal substantial differences between traditional and dialogically designed homework tasks. Lag sequential analysis shows that closed-ended assignments tend to reproduce the

conventional initiation–response–evaluation (ire) interactional pattern, characterised by strong teacher control and predominantly reproductive student responses. By contrast, open-ended tasks significantly increase the likelihood of extended dialogic sequences, foster learning talk, and encourage reciprocal exchanges among students. These results are further supported by epistemic network analysis, which indicates that dialogic homework tasks generate more distributed epistemic networks, characterised by stronger connections among reciprocity, argumentation, and cumulative knowledge building. In contrast, traditional homework produces highly centralised interactional structures revolving around teacher evaluation.
Overall, the findings suggest that the educational effectiveness of homework depends less on the amount of time students spend completing assignments than on the quality of their instructional design. The tmde framework therefore offers an alternative perspective that moves beyond the traditional debate between proponents and opponents of homework, focusing instead on the pedagogical architecture underlying task design. Within this framework, generative artificial intelligence should not be considered a substitute for students' work but rather a design partner capable of supporting teachers in creating authentic, personalised, and sustainable learning tasks that strengthen the continuity between individual learning experiences and dialogic knowledge construction (alexander, 2006; 2020).

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Inclusive co-design and AI devices: a new paradigm of pedagogical mediation for schools

Caldarelli Aldo
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The integration of Artificial Intelligence (AI) within Italian educational contexts represents one of the most complex digital transitions of the contemporary world (Han et al., 2022; Hopcan et al., 2023). Following the pandemic experience and the lockdown, schools have witnessed a proliferation of training offers for teachers, both curricular and specialized in support, often characterized by huge efforts. In this scenario, AI cannot be reduced to a simple instrumental innovation; in fact, it requires a profound redefinition of educational design and professional roles. Abandoning an initial techno-optimism, international research today requires a critical-reflective approach: integrating these technologies without analyzing their ethical assumptions risks amplifying existing inequalities. As a result, the distinction proposed in the literature between an AI used "instead of education", which replaces the relationship, and an AI used "for education", which acts in support of human pedagogical goals, becomes fundamental (Holmes et al., 2022).

AI and Didactic Co-design

In this contribution, the architecture of an AI-based pedagogical device is illustrated, designed to try to make the dialogue between curriculum teachers and specialized teachers for support activities more fruitful. The challenge of co-design, in fact, faces some structural criticalities: the clear disciplinary specialization, the fragmentation of schedules, the asymmetries of symbolic power and a persistent school culture that tends to separate skills. Added to this is the widespread tendency to interpret inclusion as a delegation and an exclusive task of the support teacher (Cottini, 2019; Giaconi, Rodrigues & Del Bianco, 2019). The designed device aims to overcome these obstacles by considering the use of AI as a facilitator for shared inclusive design.

Theoretical Framework: AI as a Pedagogical "Device"

The architecture of the system rests on a theoretical framework that emancipates itself from the purely algorithmic vision. Drawing on post-structuralist reflection, Artificial Intelligence is framed here as a real "device". It is conceived as a heterogeneous whole crossed by multiple lines of force, enunciation and subjectivation (Deleuze, 1989). In this perspective, the device models and orients the practices of the subjects involved (Agamben, 2006), structuring a complex network of practices and languages that unites curricular teacher, support teacher, student with Special Educational Needs (SEN), and researcher. On an operational level, the framework is based on Universal Design for Learning (UDL), whose three principles (multiplicity of means of representation, action/expression and involvement) guide the creation of inclusive practices. In parallel, the functional descriptions are based on the WHO's International Classification of Functioning (ICF), ensuring an ecological vision of the student. Finally, the device acts directly on teacher self-efficacy (Bandura, 1997), since the latter constitutes a solid predictor of engagement in inclusive practices: by reducing the cognitive load of design, teachers' perception of competence is increased.

Device Architecture

The design of the device is divided into three closely interconnected operational phases: The Lesson Project File: It is a "low-impact" microdesign tool intended for the curriculum teacher. Structured in only five essential fields (topic, keywords, texts, difficult terms, activities), it requires the teacher to simply explain his or her ordinary design, avoiding resistance related to work overload. The SEN Matrix: Compiled by the support teacher, it collects clinical-functional information anchored to the ICF descriptors. It includes the functioning profile, facilitators, barriers and any dispensatory or compensatory measures envisaged. The Engineered Prompt: It represents the computational core in which the LLM, through "role-prompting" techniques, analyzes the anonymized data of the first two

phases to suggest personalized educational mediators (such as maps, glossaries or summaries). It is completely pleonastic, here, to specify that the outputs of AI have a purely consultative, not prescriptive, character. The suggestions go through an essential reflective cycle in which teachers receive, evaluate, select, and readapt the materials, maintaining full professional agency and ethical responsibility for the choices.

The Experimental Research Protocol

The exploratory protocol employs a "within-subjects" methodology, consolidated in Special Education, using each participant as their own control. In order to ensure ecological validity, the sample involves centres located in Lombardy, Marche and Campania. The research is structured in three sequential phases: Phase A (Control): Frontal lesson without AI and administration of a baseline test. Phase B (Experimental): Compilation of the tools, generation of mediators (also) by AI, lesson supported by the chosen mediators and parallel verification. Phase C (Qualitative): Semi-structured interviews with teachers and students, analyzed through Content Analysis, to investigate semantic indicators related to clarity, ease and cognitive load. Particular attention has been paid to the ethics of the research: the anonymization of data through codes, parental informed consent and the conduct of interviews in a protected and non-evaluative setting are guaranteed. Above all, experimentation ensures an authentic task of inclusion without any physical or symbolic separation of the student with disabilities.

Conclusions

The adoption of this device shows that the irreducibility of the human factor in the act of teaching remains indisputable. By entrusting AI with the mere computational load of cross-referencing functional data, the teacher is given back the time to exercise the essence of his profession: the care of the educational relationship. This process triggers a "reflective ecosystem" that activates metacognition processes and promotes continuous professional development, integrated "embedded" in daily practice. In a perspective oriented towards the Capability Approach, the device is at the service of educational equity: it does not aim to provide everyone with the same tools, but offers everyone the optimal conditions for equity of outcomes. Future developments include the creation of variants of the prompt for different disciplines and the potential integration into current instructional management systems. In conclusion, AI is not the definitive answer to inclusive challenges, but it proves to be a powerful tool in the hands of the educating community.

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Artificial intelligence as a narrative mirror: inclusive storytelling practices in teacher education

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Teacher education is increasingly confronted with heterogeneous classrooms, diverse educational needs, and constantly evolving digital environments. In this scenario, inclusive design requires methodologies capable of supporting accessibility, participation, and personalization. Storytelling represents a significant resource, as it makes it possible to organize experience, construct meanings, and shape individual and collective identities. Digital storytelling expands this perspective through texts, images, audio, video, and interactive elements. The inclusive value of storytelling becomes particularly evident in light of Universal Design for Learning, according to which learner variability is an ordinary condition to be considered in the design process. Generative artificial intelligence introduces further possibilities, but it requires an intentional pedagogical framework. In the present study, it is interpreted as a "narrative mirror": a cognitive and creative mediator that helps teachers generate ideas, adapt languages, create visual supports, and imagine alternative scenarios.

Method

The investigation is configured as a descriptive exploratory study embedded in a research-training pathway. The 25-hour workshop was addressed to more than 200 teachers enrolled in the TFA support specialization courses in the academic year 2025/2026. For the purposes of the analysis, 86 initial questionnaires and 76 final questionnaires were considered, for a total of 162 voluntary responses. Participants came from preschool, primary school, and lower secondary school. The pathway included a theoretical-methodological phase, devoted to inclusive storytelling, UDL, digcompedu, digital storytelling, and the pedagogical implications of generative AI, and an operational-design phase, in which teachers created digital stories, interactive books, and shared narrative libraries. Quantitative data were collected through five-point Likert-scale items and analyzed using descriptive statistics. Qualitative data were derived from a final open-ended question and from the narrative products.

Results

During the workshop, more than 200 digital narrative artefacts were produced. The data show a positive development in the perceptions reported by the participants. Knowledge of inclusive storytelling increased from 17.5% of responses in levels 4 and 5 in the initial survey to 85.5% in the final survey, with the mean rising from 2.58 to 4.28. The use of and preparedness for narrative practices also improved: high-level responses increased from 23.3% to 77.6%, while the mean rose from 2.69 to 4.11. Inclusive narrative design represents a central dimension. At the beginning, only 18.7% of teachers placed themselves at the highest levels of the scale; by the end of the pathway, this percentage had reached 71.1%, with the mean increasing from 2.58 to 3.97. The perceived role of technologies and AI was already high in the initial survey, with 83.7% of responses in levels 4 and 5, and reached 94.7% in the final survey. The open-ended responses confirm the quantitative data. Teachers describe storytelling as a strategy capable of making learning more engaging, accessible, and emotionally meaningful. They mention personalized stories, visual and auditory supports, role playing, simulations, language development, conflict management, civic education, and support for pupils with autism, specific learning disorders, ADHD, and communication difficulties. AI is identified as a support for creating images, generating characters, adapting texts, and suggesting narrative developments.

Discussion and Conclusions

The results suggest that the integration of inclusive storytelling, UDL, and generative AI can support teacher education when digital tools are embedded within clear and reflective design. The increase in positive perceptions does not appear to depend merely on technical familiarization, but rather on the interplay between narrative methodology, accessibility criteria, and concrete experimentation. Storytelling provides the pedagogical structure, UDL directs attention towards barriers and opportunities for participation, while AI acts as a mediator for ideation, adaptation, and revision. The concept of AI as a narrative mirror makes it possible to avoid a technocentric interpretation. AI can suggest texts, images, and plots, but it does not know the history of the class, does not autonomously assess the educational appropriateness of materials, and does not define learning objectives. The teacher's responsibility therefore remains central, as teachers are called upon to formulate prompts, critically interpret responses, identify errors or stereotypes, adapt materials, and document their choices. The study presents some limitations: the questionnaire was constructed ad hoc, pre- and post-responses were not paired, there was no control group, and the focus was mainly on teachers' perceptions. Future research could use validated instruments, classroom observations, rubrics to assess the inclusive quality of digital narratives, and analyses of learning outcomes. Despite these limitations, the contribution points to a promising direction: training teachers capable of transforming digital innovation into pedagogical intentionality.

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Faculty Development for Proximity: Training Faculty and Tutors in Synchronous Digital Teaching at Pegaso University

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De Marco Elisabetta Lucia

This contribution presents the Faculty Development pathway promoted by CETAL (the Centre for Teaching and Learning) at Pegaso Online University in support of the adoption of a new teaching model grounded in synchronous interactive teaching and the Class platform. The paper frames Faculty Development not as mere technical training, but as a strategic lever for intentionally building pedagogical proximity in digital universities, proposing an institutional model assessed through indicators of participation, satisfaction, and the perceived transferability of teaching practices. The study is situated within the broader international debate on the quality of online teaching, arguing that pedagogical proximity is not an intrinsic feature of face-to-face teaching but rather a professional competence that can be intentionally designed, cultivated, and made scalable through structured, evidence-based faculty training.

Context and Training Model

Moving on from a predominantly asynchronous paradigm, the University undertook a transformation of its educational model oriented towards synchronous interaction and the shared construction of knowledge, in line with the Community of Inquiry framework (Garrison et al., 2000) and with the most recent studies on the pedagogy of tele-proximity (Themelis, 2022; Aires, 2025). CETAL therefore designed a large-scale Faculty Development pathway addressed to 395 tenured/permanent faculty (full, associate, and assistant professors), 70 adjunct faculty, and 52 university tutors, distributed across the Faculties of Human Sciences, Engineering and Computer Science, and Economics and Law. The training, delivered between 25 and 30 July 2025, combined seminars, hands-on workshops, guided experimentation with the Class platform, and e-tivity design, with the aim of developing competences in managing synchronous sessions, facilitating dialogue, formative assessment, and the critical use of artificial intelligence tools in teaching.

Participation and Monitoring

Attendance monitoring conducted by CETAL shows that 314 out of 395 tenured/permanent faculty (79.5%) completed the training on the New Teaching Model, with participation rates differing by Faculty: from 61.6% in Economics and Law to 86.5% in Human Sciences. Alongside the main pathway, the theoretical and practical modules on the new Assessment Model were also monitored (339 and 334 participants respectively), together with a pilot group for synchronous session simulation (23 participants). These results document a high level of adherence to the training pathway and suggest a significant capacity of the model to engage teaching staff in a process of organisational and pedagogical change, while also highlighting differences across disciplinary areas that call for further targeted interventions. The engagement indicators recorded by the University's IT Division (sessions with over 500 simultaneous participants and more than 1,000 qualified interactions per day between students and faculty) present the picture of an initiative capable of reaching almost the entire teaching body within a limited timeframe, while also highlighting room for improvement in the homogeneity of participation across the different disciplinary areas.

Ex-Post Evaluation: Method and Results

At the end of each training session, a satisfaction questionnaire was administered, completed anonymously by 148 participants, comprising eight items on a four-point Likert scale together with a number of open-ended questions. The results yield a consistently positive assessment: mean scores range between 3.40 and 3.88 out of 4, with the highest values recorded for the clarity of the trainers'

presentation (M = 3.88) and the relevance of the content to the teaching role (M = 3.82). 74.3% of respondents report an intention to transfer the methods learned to their own teaching, and 72.3% would recommend the workshop to a colleague. The qualitative analysis, conducted on the adjectives and free-text comments, confirms this picture: the most frequently recurring term used to describe the experience is "useful" (42 occurrences out of 148), followed by "comprehensive" and "interesting". The only systematic critical issue concerns time management and the space for live interaction, flagged by around one-fifth of respondents as an aspect to be strengthened in future editions.

Implications and Future Directions

The Pegaso case shows how pedagogical proximity — understood as relational and affective closeness even within an entirely online context — can be designed, monitored, and scaled through systematic investment in Faculty Development. The results obtained are consistent with the international literature that identifies Faculty Development as a lever for sustaining teaching innovation, strengthening teaching presence, and fostering processes of organisational change in digital universities. From this perspective, the model developed by CETAL represents an experience that is potentially transferable to other higher education contexts as well. The coherence between the positive evaluation outcomes and faculty requests for greater interactivity within the training sessions themselves suggests that future editions of the pathway should more explicitly apply, to faculty training itself, the same principles of dialogicity and co-construction of knowledge that it seeks to promote in synchronous classrooms. Future research developments will concern the integration of participation and satisfaction data with observational indicators from synchronous sessions and with longitudinal measures of the actual change in teaching practices and student learning outcomes.

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Pre-service teachers' perceptions of Artificial Intelligence: an exploratory study on current uses and professional projections

Casillo Martina
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The growing integration of Artificial Intelligence (AI) into university contexts is today a relevant theme for contemporary pedagogy (Floridi, 2022; Rivoltella, 2020), in a context in which the introduction of AI questions the very nature of the educational experience (Carlomagno, Vadalà & Ricciardi, 2026). The condition of students of Scienze della Formazione Primaria (Primary Teacher Education) takes on relevance here, since they encounter AI in their study path and, as future teachers, envisage its use in their future teaching practice. This exploratory study investigates its current uses, professional projections and the students' emotional experiences, with specific attention to the anxiety expressed towards such technologies. The analysis adopts two reference constructs, AI literacy (Ng et al., 2021) and AI anxiety (Wang & Wang, 2019), read within an enactivist-interactionist frame that conceives knowledge not as a transfer of content, but as a process emerging from the situated and embodied interaction between subject and environment (Varela, Thompson & Rosch, 1991). The research adopts a convergent, quantitatively prevalent mixed methods design (Trinchero & Robasto, 2019). Data were collected through an anonymous questionnaire administered to 470 third-year students of the degree programme in Scienze della Formazione Primaria at the Suor Orsola Benincasa University of Naples, with a mean age of 21.5 years. The instrument comprises forty-two Likert-scale items and six open-ended questions in five thematic sections; the section on anxiety takes the Artificial Intelligence Anxiety Scale (Wang & Wang, 2019) as its reference. The quantitative data were subjected to descriptive analysis, given the study's exploratory nature. On the level of use, an instrumental and selective profile emerges. AI is employed above all as a support to comprehension, since 63.4% of students use it to clarify difficult concepts or deepen examination topics, while uses entailing a more extensive delegation of cognitive work remain limited. This circumscribed use is accompanied by an appreciable critical awareness, since 68.9% declare that they recognise the limits of the tools used. The most relevant contribution concerns the emotional and professional dimension. Anxiety connected with learning the tool is almost absent, since only 4.5% declare that they feel discomfort in learning to interact with an AI system. The fear of professional replacement shows instead a more articulated trend: it remains high when referred to professions in general, but diminishes markedly when it concerns one's own role, since only 22.1% fear that AI may put it at risk. The concern thus shifts from the tool and the workplace to one's own cognitive faculties, and the fear of reducing the capacity for autonomous elaboration and writing is confirmed as the most widespread form of anxiety. The examination of response frequencies by intensity of use, carried out for purely descriptive purposes by dividing the sample into three groups (low, intermediate, high), enriches this picture. The fear of losing the capacity for autonomous writing increases as use grows, from 32.1% in the low-use group to 54.0% in the high-use group and seems to be associated with a reflective awareness linked to greater familiarity rather than with an attitude of rejection. Likewise, the intention to employ AI to prepare teaching materials rises from 9.8% to 47.2% across the same groups and appears compatible with a professional projection consistent with current personal study practices. Only 17.7% of students declare that they already feel prepared to integrate AI into their future work, while a wide share expresses the wish for specific training. The anxiety of future teachers therefore does not concern the technology, but its consequences on their own cognitive faculties, and the gap between the general fear of replacement and the fear referred to one's own role signals an implicit representation of the profession as anchored to a non-delegable relational dimension. Future teachers move between opportunities and fears, and the continuity between use in study and didactic projection, together with the widespread request for training, identifies a training need to be addressed

already in initial teacher education, so that future teachers may take an active role in the face of the transformations affecting contemporary educational systems (Taguma & Fernandez Barrera, 2019).

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Investigating the digital competence of in-service teachers through the digcompedu framework

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This study investigates the self-perceived digital competence of teachers entering Italy's 30-CFU initial teacher qualification pathways, introduced by the DPCM of 4 August 2023, which made digital competence a statutory professional requirement. Digital tools are increasingly central to teaching practice, yet initial teacher education rarely assesses digital competence systematically, leaving a gap between policy standards and novice teachers' actual readiness. The European DigCompEdu framework (Redecker, 2017) addresses this gap by defining 22 competences across six areas, extending the broader DigComp model (Carretero et al., 2017; Vuorikari et al., 2022). Its operational self-assessment tool, SELFIE for Teachers (European Commission, 2021), enables structured diagnostic measurement for developmental purposes. Three SELFIE subscales were used: Professional Engagement (PE), Teaching and Learning (TL), and Facilitating Learners' Digital Competence (FLDC), selected for their alignment with DPCM professional standards. Self-report measures carry known biases (Kruger & Dunning, 1999), but perceived self-efficacy remains a strong predictor of professional behaviour (Bandura, 1997), justifying their use as a measure of readiness rather than objective skill. Prior research on experience and digital competence shows non-linear patterns: mid-career teachers often report higher competence than novices or veterans, explained through career-cycle theory (Huberman, 1989), first-order adoption barriers among experienced teachers (Ertmer, 2005), and the TPACK model's emphasis on the interaction of technological, pedagogical and content knowledge (Mishra & Koehler, 2006).

Methodology

A cross-sectional CAWI survey was administered on 12 October 2025 to teachers entering Pegaso Telematic University's 30-CFU pathways, before any training input. After data cleaning (845 → 829 valid cases), the analytical sample comprised N = 829 (69.6% female, 29.8% male; 44 subject classes; 10 regions). Items used a 1–6 Likert scale, rescaled to 0–100. Internal consistency was excellent (Cronbach's α = .89–.91 across subscales). Shapiro-Wilk tests indicated non-normal, positively skewed distributions, so Kruskal-Wallis H tests with Dwass-Steel-Critchlow-Fligner (DSCF) post-hoc comparisons were used to test differences across four experience groups: none (n=199), ≤2 years (n=154), 3–10 years (n=338), and >10 years (n=138).

Results: overall self-perceived digital competence was low (M = 38.0%, SD = 18.3, Mdn = 35.9%), positioning the cohort at the lower B1 (Integrator) band; 41.3% of participants remained at A1–A2 and only 6.1% reached C1/C2. FLDC scored lowest (M = 34.4%), notably on Responsible Use (M = 32.9%) and Data Literacy (M = 32.5%); PE (M = 39.8%) and TL (M = 39.4%) were comparatively higher, though Computational Thinking — part of PE — recorded the single lowest item score overall (M = 29.7%, Mdn = 16.7). Kruskal-Wallis tests showed significant experience effects on every subscale (Overall $H = 66.9$, $df = 3$, $p < .001$, medium effect $\varepsilon^2 = .077$; PE $H = 57.2$; TL $H = 63.0$; FLDC $H = 59.0$, all $p < .001$). Post-hoc DSCF comparisons showed teachers with no classroom experience scored significantly lower than all other groups (all $p < .001$), while differences among experienced groups (≤2, 3–10, >10 years) were non-significant ($p \geq .177$). The relationship is therefore threshold-based rather than linear: competence rises sharply once any classroom experience is gained, then plateaus regardless of further years.

Discussion

Findings confirm DigCompEdu/SELFIE as a diagnostically valid, policy-relevant instrument for initial teacher education and reveal a structural weakness in teachers' perceived capacity to foster students' digital competence (FLDC), as opposed to their own operational tool use (PE, TL). The non-linear experience effect, consistent with TPACK and career-cycle theory, suggests that initial classroom exposure, not accumulated years, drives early gains in self-efficacy, while sustained development requires targeted training rather than experience alone. Programme design should therefore avoid assuming a homogeneous baseline, integrate digital competence across disciplinary modules rather than as a standalone unit, and prioritise the pedagogical, student-facing dimension (digital citizenship, critical engagement, computational thinking).

Limitations include reliance on self-report rather than performance data, a cross-sectional design precluding causal inference, a single-institution sample (though large and geographically diverse), and an operational, non-validated mapping of composite scores onto DigCompEdu's six proficiency bands, given the absence of official SELFIE cut-offs.

Conclusion

This large-scale Italian baseline shows low-to-moderate self-perceived digital competence among incoming 30-CFU teachers, a particular weakness in fostering students' digital competence, and a threshold, rather than gradual, effect of teaching experience. The findings offer an empirical reference point for designing differentiated digital-competence training within initial teacher qualification programmes and for future longitudinal, cross-institutional research.

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Digital cognitive capital and generative AI: RAG Socrate as a methodological environment for epistemic awareness

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Generative Artificial Intelligence is entering educational and research contexts with increasing intensity. Its interfaces make it possible to access information, produce texts, summarise contents, reformulate materials, and adapt resources to different educational needs. In this first operational dimension, generative AI appears as a tool of mediation: it can modify the language of a resource, reduce its complexity, reorganise its structure, and make it more accessible. The literature on Artificial Intelligence in Education has already highlighted these possibilities, together with the need to analyse the pedagogical, ethical, and epistemic implications connected to the use of intelligent systems in educational processes (Holmes et al., 2019; Kasneci et al., 2023; UNESCO, 2024).

The specific feature of Large Language Models lies in their ability to simulate natural language and generate fluent, coherent, and contextually plausible answers. This linguistic quality influences the way users attribute reliability and epistemic value to generated outputs. A well-structured answer, clearly formulated and organised according to a recognisable argumentative logic, may be perceived as reliable even when the user has limited access to the conditions that shaped its production. The plausibility of the answer therefore becomes a relevant pedagogical object, because it involves the relationship between language, trust, source, and validation (Bender et al., 2021; Bommasani et al., 2021; Kasneci et al., 2023).

This dynamic places the interaction with generative AI within an educational space where expectations of competence, communicative proximity, caution towards the artificial, and the possibility of automatic reliance on the system's answer are closely connected. The educational issue concerns the development of a stance capable of critically engaging with the relationship with the artificial, avoiding both the reduction of AI to a threat and its acceptance as a self-sufficient source of knowledge (Long & Magerko, 2020; UNESCO, 2024).

This paper starts from this threshold: the moment in which a generated answer is questioned, verified, or accepted as valid. The generated answer appears to the user as a fluent and complete text, while the conditions that guide its production often remain opaque: sources, selection criteria, instructions, parameters, and configurations of the AI system. This gives rise to the pedagogical need to design educational situations in which these conditions can be recalled, observed, and discussed, so that the plausibility of the output is connected to practices of verification and validation (Bender et al., 2021; Bommasani et al., 2021; Lewis et al., 2020).

The RAGTIME laboratory is placed within this perspective. It is designed to transform the answer generated by the AI system from a product to be accepted into a process to be questioned. The laboratory uses Socrate, an orchestrated RAG system developed within Tiresia, the Inter-University Team for Educational Research on Artificial Intelligence. The intentional use of Socrate makes it possible to work on a controlled documentary corpus and to make some components of the generative process observable, including retrieved sources, selected documentary portions, system instructions, generation parameters, and final output (Lewis et al., 2020). The laboratory is organised into two phases: a first interaction with Socrate in an opaque condition, and a second interaction in a configurable condition. The same question is addressed in both phases, to make observable the passage from the evaluation of the answer to its interrogation.

This paper presents the design and the first exploratory evidence of a pedagogical study conducted through the RAGTIME laboratory. The theoretical framework is based on four main areas: trust in the output and linguistic simulation; digital cognitive capital and epistemic awareness; generative AI as a socio-technical network; and the boundary between cognitive extension and cognitive delegation.

Starting from these references, Socrate is used to investigate the practices through which participants question, interpret, verify, and validate generated answers (McLuhan, 1964; de Kerckhove, 2025; Latour, 2005; Clark, 2008).
The experimentation was conducted in academic and advanced training contexts, involving PhD students, teachers, and researchers, according to an exploratory orientation consistent with mixed methods approaches to the understanding of complex educational phenomena (Creswell & Plano Clark, 2018). The materials collected through Google Forms document evaluations, motivations, criteria for stopping or continuing the interaction, and perceptions of variations between outputs. These materials are treated in a descriptive and qualitative way, with the aim of identifying recurring elements related to trust, verification, comparison, and validation of the output, in line with the exploratory orientation of the study and with the approach of thematic analysis (Braun & Clarke, 2006).
The first evidence indicates that the passage from the opaque condition to the configurable condition supports greater attention to the conditions of production of the output: sources, retrieved documentary portions, instructions, parameters, and the user's interpretative stance. The study identifies RAGTIME as a space for research and training to explore the activation of digital cognitive capital, the construction of epistemic awareness, and the threshold between cognitive extension and cognitive delegation in the interaction with generative AI.

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Artificial Intelligence and school leadership in inclusive organisational processes.

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This article offers a theoretical and methodological reflection on the relationship between Artificial Intelligence (AI) and school leadership, on the assumption that the spread of intelligent systems constitutes an epistemological transformation capable of redefining educational governance, decision-making processes and school organisation. In line with the paradigm of complexity (Morin, 2001), innovation is not interpreted as the mere introduction of digital tools, but as a redefinition of the categories through which schools observe, interpret and govern the educational reality. AI therefore represents a pedagogical challenge even before it is a technological one, requiring leadership capable of integrating organisational, ethical, pedagogical and technological dimensions, and orienting them towards equity, participation and inclusion (Fullan, 2014). From this perspective, education continues to be aimed at human development (Biesta, 2022) and the expansion of people's capabilities (Nussbaum, 2011).

Educational leadership is described as a systemic competence based on the construction of shared meanings and organisational culture (Bonazzi, 2002; Schein, 1983). The main leadership models converge in emphasising the leader's ability to promote motivation, participation, innovation and continuous improvement (Bush & Glover, 2003; Burns, 1978; Bass & Riggio, 2006; Hallinger & Murphy, 2013). Digital transformation broadens these responsibilities, requiring leadership capable of governing the use of AI through an educational vision guided by values and accountability.

Drawing on Floridi (2014), this paper interprets AI as a factor in the reconfiguration of the infosphere and the educational ecosystem. The potential offered in terms of personalised learning, analysis of educational needs and support for decision-making processes (Holmes et al., 2019) is inseparable from the critical issues relating to algorithmic transparency, the protection of personal data, bias and the delegation of decision-making (Coeckelbergh, 2020; Selwyn, 2019; UNESCO, 2023). This gives rise to the need for anthropocentric, responsible and inclusive governance, consistent with the Guidelines of the Ministry of Education and Merit (MIM, 2025), in which the headteacher assumes the role of guarantor of the correct balance between technological innovation and educational objectives.

Within this framework, the concept of AI literacy takes centre stage, understood as the ability to understand, use, monitor and critically evaluate AI systems (Long & Magerko, 2020; Ng et al., 2021). School leaders are called upon to promote this literacy throughout the entire professional community, by developing an organisational culture capable of critically examining dig l tools and of preserving the primacy of human judgement. The reference to the Capability Approach further reinforces this perspective, highlighting how the value of AI must be assessed in relation to its capacity to enhance learning, participation, agency and inclusion (Cesaroni et al., 2025; Nussbaum, 2011; Sen, 2000).

From a methodological perspective, this paper outlines the process of developing the assessment tool intended for the subsequent survey of Italian school leaders. Following a critical review of tools dedicated to educational leadership and the main frameworks on digital competences, the authors highlight the persistent gap between studies on leadership and those on Artificial Intelligence. This gap justifies the adoption of the AI-Driven Pedagogical Leadership Agility Scale (AIDPLA) by Khasawneh et al. (2026), one of the first tools designed to measure pedagogical leadership in the age of AI.

The AIDPLA scale assesses five dimensions: algorithmic vision of leadership, ethics and transparency of intelligent systems, values-based leadership, AI-supported pedagogical innovation, and crisis management through data-informed processes. Building on this model, the authors have designed a questionnaire comprising a section derived from the scale and an original section aimed at gauging the frequency of AI use, areas of application, benefits, perceived challenges and training needs of school leaders. The aim is to establish a link between the level of AI-driven leadership and the actual governance practices of Italian educational institutions.
Future prospects identify the extension of the research to middle leaders and system-level figures as a direction consistent with the literature on distributed leadership (Spillane, 2005; Paletta, 2020; Harris & Jones, 2019), with a view to understanding how pedagogical leadership competencies are translated into organisational practices and inclusive processes. The conclusions reiterate that the development of the instrument represents a fundamental epistemological step, as it makes the theoretical categories that will guide subsequent empirical research observable (Dewey, 1938; Ricoeur, 1990). The questionnaire aims not only to gauge school leaders' familiarity with AI, but also to interpret the transformations in the school's organisational culture and governance processes, whilst keeping educational responsibility, human judgement and the protection of the individual at the centre. From this perspective, AI takes the form of a pharmakon (Stiegler, 2008), the value of which will depend on the ability of school leadership to guide its use in accordance with principles of equity, inclusion and human development.

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AGI as a prompt in the inclusion process: a preliminary study on teachers' professional resources.

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The technological development of our era, formerly known as the Fourth Industrial Revolution, has enabled an increasingly wider audience to experiment with various Generative Artificial Intelligence (AGI) models on a daily basis. Their rapid diffusion has prompted major international organizations and supranational institutions to engage in dialogue and debate on the definition of criteria and regulatory frameworks to adopt for the critical and responsible use of LLM systems. This approach, aimed at a growing understanding of algorithmic systems, is also appreciated in the scientific literature on special education, where reflections on the potential and risks associated with experimentation in educational contexts abound. While it is possible to affirm that the conscious use of AGI can assist teachers from a performative perspective in the implementation of task analyses designed to support the process of student inclusion, it is equally necessary to consider that generative systems produce output based on probabilistic associations between data and textual recurrences. In the absence of explicit and informed design guidance, these systems tend to yield statistically more likely responses and potentially lean toward standardization, thus reducing and narrowing the scope for pedagogical intentionality and the exercise of the professional skills required to co-construct their students' Life Projects. In this sense, integrating AGI into the support of students with Special Educational Needs (SEN) would require the development of a literacy process that is substantiated by structuring the human-machine relationship into three synergistic phases, redefining the role of the teacher as a mediator, and avoiding a purely functionalist approach to technology (Fiorucci & Bevilacqua, 2024; Lizio et al., 2025).

First, the process begins with the teacher's formulation of the prompt. The process of designing text prompts represents the first manifestation of the teacher's pedagogical intention, as they define and circumscribe the teaching constraints even before interrogating the machine (Brafa et al., 2025). Second, the machine responds by generating a plausible and adaptive algorithmic output that functions as a temporary scaffolding device within the educational relationship (Bonavolontà et al., 2025). Third, the process is achieved through the teacher's validation and critical refinement of the output, achieved through strong confidence in their own skills and the awareness of being able to positively impact their student's future development.

In this sense, the perception of self-efficacy and certain functional patterns of metacognitive beliefs would be the cognitive prerequisites for teacher agency, necessary to resist automation bias and shape the technological artifact to the biological singularity, complex needs, and future existential trajectories of the student, from a systemic perspective oriented toward the co-construction of their Life Project (Pavone, 2015).

This paper, a preliminary phase of an experiment on the use of AI in teaching, analyzes the prerequisites for a human-machine interaction model aimed at enhancing teacher agency and teachers' reflective skills through a quantitative survey conducted on 200 secondary school teachers. The research was conducted by administering two standardized instruments to participants: MCQ 30 and TEIP. Data analysis revealed a significant negative correlation between certain dysfunctional metacognitive patterns and sense of self-efficacy. Specifically, negative beliefs about the uncontrollability of one's thoughts and low confidence in one's cognitive functions would negatively impact Teacher Agency, compromising perceived efficacy in inclusive practices ($r = -0.170$, $p = .016$) and the ability to manage dysfunctional classroom behaviors ($r = -0.185$, $p = .008$).

The AGI would act as an external scaffolding device, reducing the cognitive load associated with the technical structuring of materials, mitigating the negative effect generated by dysfunctional beliefs. Future research paths converge toward the implementation of a field trial based on intentional prompting, intended as a reflective training ground for teachers. The goal is to validate AI Literacy pathways that, by using intentional prompting as a metacognitive monitoring device, offer teachers a tool to consolidate confidence in their own skills and reposition the Teacher Agency as the ethical and decision-making hub of the inclusive digital transition (Izzo et al., 2025; Sortino, 2025).

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From the Workplace to the Classroom: A Mixed-Methods Approach to Measuring AI-Related Creativity. The AICREA Scale and a Qualitative Analysis of SME Managers

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The introduction of generative artificial intelligence into organizational and educational contexts is redefining the conditions under which human creativity emerges. When individuals interact with a generative system to produce texts, images, or solutions, the creative outcome can no longer be attributed exclusively to individual abilities. Rather, it takes shape within an interactive space in which individuals guide the process while retaining critical and authorial responsibility. The willingness to engage in this space depends on affective and cognitive dispositions—including a propensity for cognitive risk-taking, ideational fluency, and tolerance of ambiguity—which the literature has shown to be more responsive to environmental conditions than to stable individual characteristics. This study investigates these dispositions through a mixed-methods design that integrates psychometric measurement conducted on a large organizational sample with a qualitative investigation involving managers of small and medium-sized enterprises (smes).

From a theoretical perspective, the study draws on the Dynamic Componential Model (Amabile & Pratt, 2016), which identifies creativity-relevant processes—ideational fluency, a propensity for cognitive risk-taking, and the ability to connect distant concepts—as the component of individual creativity most responsive to environmental influences. It also draws on the interactionist model developed by Woodman, Sawyer, and Griffin (1993), which locates organizational creativity within the interaction among individual, group, and organizational levels. The integration of these two models allows two non-mutually exclusive hypotheses to be formulated: the augmentation hypothesis, according to which exposure to AI enhances creativity-relevant processes over time, and the self-selection hypothesis, according to which individuals who are already more creative tend to adopt AI more frequently.

The quantitative strand employed the AICREA (AI-augmented creativity) scale, a 10-item Likert-type instrument specifically developed to measure creativity-relevant processes in AI-augmented contexts. The scale comprises three subscales: Cognitive Risk Fear, Imagination, and Thought Complexity. It was administered to 743 TIM S.p.A. Employees during the PRE phase of the AI4CREA project, prior to the systematic introduction of Microsoft Copilot. A preliminary item analysis—including item-total correlations and Cronbach's α—led to the final 10-item structure. Internal consistency was satisfactory for Cognitive Risk Fear ($\alpha = .782$) and Imagination ($\alpha = .830$), whereas it fell below the conventional threshold for Thought Complexity ($\alpha = .588$). A hierarchical multiple regression analysis ($N = 697$) identified prior AI use as the only significant predictor of baseline creativity ($\beta^* = .357$, $p < .001$, $\Delta R^2 = .118$), independently of participants' sociodemographic and organizational characteristics. This finding is consistent with the experimental evidence reported by Jia, Luo, Fang, and Liao (2024), according to which interaction with AI activates exploratory cognitive processes that transfer to subsequent tasks.

The qualitative strand involved eleven SME managers who participated in semi-structured interviews analyzed using thematic coding (Braun & Clarke, 2006). The findings indicate that creativity is conceptualized as a situated and organizational process fostered by participatory practices, adaptive flexibility, and continuous training. AI is predominantly described as an enabler—a virtual colleague,

tutor, and accelerator of ideation in problem-solving, idea development, and data analysis—rather than as a substitute for human creative responsibility.

The two strands converge in suggesting that dispositions toward AI-related creativity depend more on organizational conditions and prior experience with the technology than on stable individual characteristics. This convergence has direct implications for education and training. If AI-related creativity is a context-sensitive disposition, its development requires learning environments capable of addressing both the affective component—resistance, fear of cognitive risk, and hesitation toward a technology perceived as a threat to professional autonomy—and the cognitive component, in line with the construct of Digital Affective Literacy (Long & Magerko, 2020; Ng et al., 2024). The practices described by the managers—including internal academies, dedicated training programmes, and interdisciplinary dialogue—constitute a repertoire that can be transferred to educational settings. This repertoire may help rethink teacher education in relation to the tension between technological resistance and the uncritical adoption of AI, transforming this tension into an opportunity for conscious pedagogical reflection and practice.

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Between Technical Efficiency and Affective Resistance: Evidence for an Ethical Integration of AI in Teacher Training

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The evolution of Artificial Intelligence (AI) is reconfiguring educational systems, reshaping the tenets of knowledge and the relational dynamics of instructional practice. Within this transition, computational AI's evolution reconfigures educational systems, altering classroom ecology, dismantling vertical knowledge transmission, and shifting assessment toward higher-order skills (Luckin, 2018; Selwyn, 2019). Adopting a Critical AI Literacy framework (Veldhuis et al., 2025), this study emphasizes understanding algorithmic agency, ethical impacts, and algorithmic justice.
Critical oversight operations rest on the Human-in-Command principle (Floridi, 2022), asserting assessment as a human prerogative rooted in a student's biography. This fosters an "augmented intelligence" where routine-free time enhances educational relationships, mitigating cognitive passivity from chatbots (Andler, 2024). Ultimately, Digital Affective Literacy empowers teachers as pedagogical directors of care (Pellerey, 2024).
The study adopted a convergent parallel mixed methods design to analyse teachers' perceptions and self-efficacy levels regarding AI. The non-probability convenience sample consists of 263 pre-service special education teachers at the University of Salerno (A.Y. 2024/2025, X Cycle). Demographically, the sample is predominantly female (83.6%) and highly concentrated within the 40–49 age bracket (40.3%). Seniority of service highlights the "new-entry paradox", with 80.6% of the subjects having fewer than 5 years of teaching experience.
Quantitative data were collected using an adapted questionnaire (Işık et al., 2024) investigating four latent constructs (knowledge, practice, anxiety, utility) on a 6-point Likert scale. The qualitative phase involved a targeted sub-sample of 8 teachers who underwent individual semi-structured interviews. Data analysis involved descriptive statistical processing of the quantitative data (merging the positive scale steps 4, 5, and 6) and a manual thematic content analysis of the qualitative data.
The quantitative analysis reveals an asymmetry between theory (knowledge) and practice (practice): while 65.8% of teachers report sufficient knowledge and 59.7% are inclined toward self-directed professional development, 49% struggle to select the appropriate tool for specific learning objectives. Although AI is considered easy to use (67.2%) and efficient for bureaucracy (67.2%), the ability to design mediated learning environments drops to 53.1%, and actual classroom use stands at just 50.8%.
Within the anxiety dimension, 51.5% fear student demotivation and 52.7% dread technological dependency leading to the atrophy of cognitive skills, prompting 49% to limit its use. Regarding the utility dimension, 53.7% see no link between AI and performance enhancement, and only 27.4% agree with allowing students to monitor their own learning processes via AI, highlighting a deficit in reflective usage.
The qualitative analysis records total saturation (8 out of 8 interviewees) on the themes of dehumanization, empathetic erosion in assessment (the algorithmic "cold wall"), and systemic bias, while 7 out of 8 emphasize cognitive passivity. Data triangulation reveals a modern Frankenstein Complex (Asimov, 1947): an affective block that relegates AI to mere logistical automation.
To defuse this defensive inertia, it is recommended to update the Specialization Programs for Educational Support by orienting ICT courses toward digital citizenship and school democracy. We propose integrating the Digital Affective Literacy Model into ICT laboratories, structured around three main axes: algorithmic ethics and bias deconstruction through code-switching sessions; Human-in-Command instructional design to configure generative AI as a scaffolding tool; and digital

empathy and pedagogical care via role-playing activities designed to preserve the embodied gaze and clinical listening in the face of techno-pedagogical anxiety.
Although limited by a local and non-probability sampling design, the study offers a universal lens by demonstrating that the governance of generative AI requires the enhancement of teachers' ethical and socio-emotional competencies. Future research paths should develop longitudinal investigations to measure the actual impact of symbiotic technologies on inclusion levels and on the academic success of students with educational vulnerabilities.

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Supporting IEP Selection in Italy: A Mathematical Decision-Support Model Based on Screening Data

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Inclusive educational planning in Italy requires teachers to integrate multiple dimensions of students' functioning when identifying the most appropriate Individualised Educational Plan (IEP). This complexity can generate uncertainty, particularly when cognitive, communicative, social, educational, and executive-function characteristics overlap. The present study develops a structured decision-support model designed to support teachers in the preliminary selection among the three IEP pathways available in the Italian framework. The model is intended to support, rather than replace, teachers' professional judgement and multidisciplinary decision-making.

The proposed system combines a screening questionnaire with a transparent rule-based mathematical formula. The questionnaire comprises 38 items distributed across five domains: cognitive competences (6 items), linguistic and communicative competences (8), social and personal autonomy (7), educational competences and skills (12), and executive functions (5). Each item can be answered as Yes, Partially, No, or Not Applicable. The first three responses are scored 3, 2, and 1 respectively, whereas Not Applicable is excluded from the calculation. The resulting score ranges from 0 to 114 and is mapped onto three IEP pathways: Differentiated IEP with alternative outcomes (0–67), IEP with minimum learning outcomes or modified standards (72–90), and Curricular IEP (96–114). Two transition areas (68–71 and 91–95) were introduced to account for borderline cases and to preserve the educational team's professional discretion.

The model was developed iteratively and tested with primary and lower secondary school teachers. Ninety teachers participated in the initial study in November 2025. After excluding incomplete or unclear responses and cases with excessive or inconsistent Not Applicable answers, 81 cases were retained for analysis; 76 concerned real student profiles. The recommendation generated by the model was compared with the IEP independently indicated by participating teachers. Across the full analysed sample, exact agreement was 64% (52/81), increasing to 69% (56/81) when transition areas were considered. After excluding 11 cases in which the teachers' initial IEP selection was judged inconsistent with the relevant ministerial and biopsychosocial criteria, agreement reached 80% (56/70), or 81.4% (57/70) when grey-zone cases were included. Considering real cases only, agreement was 67% (51/76) for exact matches and 72% (55/76) including transition areas; among the 65 real cases considered appropriate, the final agreement was 80% (52/65).

These preliminary findings suggest that a transparent computational model can provide useful, structured support in a decision that is currently strongly dependent on professional interpretation. The introduction of transition areas appears particularly relevant because it avoids forcing complex student profiles into rigid categories and instead identifies situations in which two adjacent pathways may reasonably be considered. The model therefore translates teachers' observations into a structured recommendation while retaining professional autonomy.

The study has important limitations. The validation sample was relatively small, recruited through snowball sampling, and drawn from one Italian region (Campania). The questionnaire also assigns equal weight to all items, although different domains may have different predictive relevance. Further research should test the instrument with larger and geographically diverse samples, include upper secondary education, examine its psychometric properties, and investigate alternative weighting systems. Future studies should also assess the practical effects of the tool on teachers' decision-making confidence, satisfaction, and the quality of individualised educational planning. Overall, the

proposed model represents a preliminary step toward transparent and interpretable technological support for inclusive educational decision-making in the Italian school context.

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Attitudes Toward Artificial Intelligence in Teacher Education: The Contribution of Cognitive and Emotional Variables

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The integration of Artificial Intelligence (AI) into educational contexts is profoundly transforming teaching and learning processes, creating new opportunities for personalized instruction while simultaneously raising pedagogical, ethical, and professional challenges (Chen et al., 2020; Zawacki-Richter et al., 2019). While traditional technology acceptance models have primarily emphasized the role of digital competencies and perceived usefulness (Davis, 1989; Venkatesh et al., 2003), more recent studies suggest that AI adoption is also shaped by emotional factors, including anxiety, distrust, fears of professional replacement, and concerns about the quality of the educational relationship (Schepman & Rodway, 2020; Liu & Liu, 2025).

Within this framework, the present study investigates the combined contribution of cognitive and emotional factors to the development of attitudes toward Artificial Intelligence, assuming that AI acceptance is a multidimensional process in which knowledge, competencies, and emotional experiences interact dynamically.

Research Design

The study involved 423 participants enrolled in university initial teacher education programs. Attitudes toward AI were assessed using the General Attitudes toward Artificial Intelligence Scale (GAAIS), whereas AI-related anxiety was measured through the Artificial Intelligence Anxiety Scale. AI literacy was assessed using a questionnaire on perceived AI competencies. To further explore teachers' specific forms of resistance toward AI, the Teacher AI Emotional Resistance Scale (TAERS 2.0) was developed, comprising four dimensions: AI Anxiety, Identity Threat, Relational Disruption, and Epistemic Distrust. Data were analyzed using Pearson's correlations, multiple linear regression analyses, and bootstrap mediation models.

Results

The findings indicate that higher levels of AI literacy are associated with more positive attitudes toward Artificial Intelligence and contribute to reducing technology-related anxiety and distrust in the reliability of intelligent systems. However, this protective effect appears to be limited to dimensions directly related to the operational use of AI. Technical competencies do not significantly reduce concerns regarding the potential loss of teachers' professional identity or fears about the weakening of the educational relationship, which represent the deepest forms of resistance to innovation.

Multiple regression analyses revealed that these dimensions are explained primarily by individuals' general attitudes toward AI rather than by their level of technical competence. Furthermore, mediation analyses showed that AI anxiety exerts both direct and indirect effects on the different dimensions of emotional resistance by negatively influencing general attitudes toward AI. General attitude therefore emerged as the main psychological mechanism through which emotional responses shape AI acceptance in educational settings.

Conclusions

Overall, the findings suggest that developing technological competencies is a necessary but insufficient condition for promoting the effective integration of Artificial Intelligence into educational practice. The most significant barriers concern the redefinition of teachers' professional identity, the preservation of the relational dimension of teaching, and trust in AI-supported decision-making processes.

From a pedagogical perspective, these findings highlight the need to design teacher education programs that combine AI literacy with critical reflection on the educational, ethical, and professional implications of Artificial Intelligence. Training focused exclusively on technical competencies is unlikely to address the emotional resistance that continues to represent one of the main obstacles to the informed adoption of AI. Promoting balanced, critical, and evidence-based attitudes toward Artificial Intelligence therefore appears essential to enable future teachers to integrate AI effectively into educational practice while preserving the central role of pedagogy and the teacher–student relationship.

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AI in teaching for a digital humanism: ethical conditions, critical training of teachers and the primacy of the educational relationship

Liverano Giuseppe

"This study introduces the metaphor of Artificial Intelligence (AI) as a 'symbiote' or 'alien organism' (Floridi, 2014), drawing inspiration from the medical domain, where the integration of AI systems into the human body for therapeutic purposes requires a rigorous anthropological selection of suitable subjects."This paradigm offers the opportunity for a rereading of the pedagogical debate on the use of AI in teaching: just as the medical community identifies the subjects compatible with hosting AI for therapeutic purposes, in the same way the education system should identify rigorous and formative criteria for teachers who intend to use this technology for educational purposes.

The use of AI in teaching requires a selection based on ethical and anthropological compatibility and a professional evaluation of the teacher, his pedagogical skills, his critical conscience and his educational wisdom and maturity. A teacher without pedagogically and ethically grounded training in the relationship with AI risks being reduced to a mere executor of algorithms (Williamson, 2023).

Understanding AI for use in human-centric teaching

The analysis is divided into a first section that explains how AI works as a system capable of supporting learning. According to the definition by Russell and Norvig (2021), AI is "a study or field of investigation of intelligent agents, an entity that receives perceptions from its surroundings determining actions as reactions".

AI processes information through three phases: receiving input, processing to identify patterns and rules, and applying what has been learned to provide an output based on statistical and probabilistic approaches. The accuracy of the AI's work depends solely on the nature and quality of the inputs received.

The use of AI in education has raised philosophical questions about how it can align with human values such as transparency, fairness, accountability, and loyalty. The risks of using AI unanchored from these values are significant. A deformed anthropomorphization could generate perceptual distortions and undue assumptions of responsibility. The absence of moral rules would risk producing offensive outputs. A total misalignment with human values could generate outputs capable of undermining human well-being, amplifying cultures of prejudice, and increasing inequalities and discrimination.

Future development must move towards human-centric, pedagogically and ethically guided AI, aimed at expanding human capabilities, not replacing them (Baker, 2016). To this end, it is necessary to identify guidelines for teacher training that also take into account the development of character and personality traits, as well as values and virtues.

Systematic Review Methodology

The third section of the paper presents a systematic review of the literature on the role of teachers' skills, character and personality in training in the use of AI.

The research explored databases such as Scholar, ERIC, MDPI, and ScienceDirect. After careful screening, the initial selection identified 108 studies, reduced to 92, then to 63 after the elimination of non-accessible contributions. Of the 63 articles assessed as admissible, 53 were further excluded as irrelevant, and only 10 studies were considered for systematic review, following the PRISMA guidelines.

Review results

The 10 studies included in the review highlighted significant relationships between the personality traits of the Big Five model and the use of AI in teaching. In particular:

Open-mindedness and openness, conscientiousness, and agreeableness emerged as positive predictors of teachers' adoption of AI;
Neuroticism showed a negative association with the didactic use of AI, being positively associated with cost perception and anxiety, and negatively linked to motivational dimensions
Conscientiousness and responsibility have emerged as anxiety mitigators in the use of AI
Personal innovation, flexible thinking, and psychological capital were found to be skills that may encourage teachers to adopt AI for teaching purposes;
Open-mindedness has proved to be the strongest predictor, useful for generating complex, creative and original teaching scenarios.

Analysis and discussion

The analysis of the studies has highlighted how the integration of AI in teaching cannot compromise the primacy of the educational relationship between teacher and student. Its use must be inspired by an anthropological model where human relationships are a source of revelation and adaptation to the principles of justice and social equity.

It is commonly misguided to think that AI is being ethical. The correct use of AI depends on the sharing of a social ethic, as a set of ordering principles and as a compass for the teaching action of teachers supported by AI. It is important to consider this technology not only in its predictive and prescriptive potential, at the service of a pedagogy of intention, but rather as a descriptive-hermeneutical support for observing what happens in the classroom and interpreting dynamics and behaviors.

Conclusion

The literature review indicates that AI in education is as closely linked to digital literacy as it is to a wealth of skills, character traits, and values. The functionality of this technology ultimately depends on the teacher's human qualities, character, personality, and reference values. Future research should focus on shared regulations grounded in a social ethic, ensuring that AI operates as an inclusive equaliser rather than an amplifier of inequalities.

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Designing with AI, Teaching the Body: A Pilot Study on Pre-Service Teacher Training for Embodied Emotional Literacy

Lombardi Dario

Alexithymia, childhood obesity, and eating disorders converge in one educational emergency: children unable to read their own bodily signals. Somatic-marker theory (Damasio) and interoception research ground emotion in bodily sensation; embodied-cognition and body-oriented intervention (BOI) studies show teaching emotion through the body outperforms purely verbal approaches. SEN students (ADHD, SLD, disadvantage) are disproportionately affected, yet teacher training rarely builds operational body-based competences. Generative AI offers an unexplored opportunity: articulating embodied pedagogical intuitions to a bodyless system may externalize tacit knowledge (Polanyi, 1966; Nonaka & Takeuchi, 1995). This study introduces EEL, integrating embodied-emotion theory, BOI research, and interoception, asking: (RQ1) Does AI-assisted ADDIE co-design increase EEL design self-efficacy? (RQ2) What theoretical knowledge do participants demonstrate? (RQ3) How useful is AI perceived as a co-design partner for SEN-inclusive interventions? (RQ4) Is the experience perceived as professionally transferable?

Methodology

An exploratory mixed-methods pilot used a retrospective then-test (Howard et al., 1979) to avoid response-shift bias and preserve anonymity. Participants: N=54 first-year LM-85bis students (92.6% female, mostly under 20, 96.3% from Southern Italy). The 120-minute session followed ADDIE: baseline questionnaire; lecture on the emergency and EEL construct; 50-minute small-group co-design with an AI chatbot (Claude Sonnet) using SEN context cards and design constraints; plenary debriefing; post questionnaire. Instruments: an adapted Teacher Self-Efficacy for SEL scale (TSE-SEL, 16 items, α=.955), a 10-item Knowledge Test, a Perceived AI Utility scale (PAUID, 10 items, α=.810), a Methodological Comparison Scale, and two open questions. Paired-samples t-tests and Cohen's d were computed for TSE-SEL; descriptive statistics for other scales.

Results

TSE-SEL total scores rose from M=41.07 to M=56.07 (Δ=+15.00; $t(53)=9.305$, $p<.001$, $d=1.266$), with large effects in emotional ($d=1.303$) and bodily ($d=1.156$) subscales, consistent across all 15 items. The Knowledge Test averaged M=8.87/10 (90.7% scoring $\geq$8); the main gap concerned distinguishing alexithymia from emotional hyperreactivity. PAUID averaged 3.68/5; top items concerned future classroom use (M=3.89) and AI as a design ally not replacing judgement (M=3.83); critical correction of AI output scored lowest (M=3.13). 98.1% agreed the experience gave usable tools and that body-emotion training should be systematic; 94.4% considered bodily and emotional education inseparable. Qualitative responses described a shift from viewing the body as an emotional "container" to its origin, with transfer proposals tailored to SEN profiles.

Discussion

The self-efficacy gain ($d=1.266$) exceeds typical effect sizes for in-service SEL teacher training ($d=0.30$-0.60); its uniformity across items suggests a genuine shift rather than a desirability artifact, though the retrospective, single-session design warrants caution regarding response-shift bias and "competence inflation." Knowledge acquisition was strong despite low baseline familiarity (74.1% had never encountered alexithymia). PAUID data support AI's hypothesized maieutic function: dialogue with the chatbot helped externalize tacit knowledge while preserving professional autonomy. The low critical-revision score indicates AI critical literacy does not emerge spontaneously and should be explicitly taught (e.g., structured "AI audit" phases). Results also suggest a values reorientation regarding body-based education. Limitations include a convenience sample, no control group, no follow-up, and partial validation of ad hoc scales.

Conclusions

A single 120-minute ADDIE+AI session produced large gains in self-efficacy, solid theoretical knowledge, and high perceived utility of generative AI as a maieutic co-design partner for EEL interventions targeting SEN pupils. Participants recognized a systemic need to embed body-emotion education in teacher curricula. Findings support EEL as a promising, empirically groundable construct and outline priorities for future research: larger samples, control groups, follow-up, and AI-literacy training.

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From Frankenstein to IoToys:
educating between control and autonomy in the age of datafication

Malara Silvestro
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The tension between control and autonomy increasingly shapes contemporary educational models, fostering approaches oriented toward the construction of the "perfect child." This tension evokes the figure of teachers and educators as creators, highlighting the enduring risk of a pedagogy of fabrication, as powerfully anticipated in Mary Shelley's Frankenstein and later rearticulated in pedagogical theory (Shelley, 1818; Meirieu, 1996; Biesta, 2009). The figure of the "Frankenstein educator" embodies the illusion that education can fully determine its outcomes, reducing the learner to an object of design, rather than recognizing them as a subject of freedom (Meirieu, 1996). Education is thus progressively exposed to a logic of prediction, optimization, and technical control, shifting away from its relational and open-ended nature.

Within this framework, the growing pervasiveness of digital infrastructures in early childhood education intensifies such tensions. IoToys – connected toys such as smart dolls, robots, and wearable devices – emerge as key actors in the reconfiguration of contemporary learning environments. Through continuous processes of datafication, these devices collect, process, and interpret children's interactions, movements, and behaviors. On the one hand, they enable new forms of personalization and care in learning, supporting adaptive educational pathways. On the other, they reinforce a pervasive logic of monitoring, behavioral optimization, and predictive governance, extending algorithmic rationality into early developmental contexts (Holloway & Mascheroni, 2019; Floridi, 2022).

Embedded in increasingly datafied educational ecosystems, reconfigured as interconnected "non-places", IoToys contribute to redefining the ontology of the educational space itself. Learning environments are no longer confined to physical or relational settings, but become hybrid, distributed, and continuously mediated by data flows. In this context, play – traditionally understood as a foundational space of autonomy, imagination, and relational development – is progressively transformed into a data-generating activity, subject to forms of extraction, classification, and normalization (Bonaiuti et al., 2017; Lancini & Cirillo, 2022).

This shift is particularly critical in early childhood, where processes of datafication begin from the earliest stages of life and intersect with family practices such as sharenting, as well as with the increasing penetration of digital infrastructures into domestic and educational spaces. As a result, the distinction between care, guidance, and control becomes increasingly blurred. Educational environments risk becoming sites of implicit governance, where children's behaviors, preferences, and developmental trajectories are continuously shaped through algorithmic feedback loops.

The paper adopts a theoretical-critical approach to examine these transformations, positioning itself within the broader field of teacher and educator training understood as a reflective and critical practice. Rather than focusing on technical training, it emphasizes the need for a pedagogical approach, capable of interrogating the ethical, political, and epistemological implications of digital technologies in education. In this sense, forms of technophobic resistance should not be construed as mere rejection of innovation, but rather as analytically significant articulations of concern regarding autonomy, agency, and the evolving configuration of educational relationships (Selwyn, 2016; Biesta, 2010). However, such an interpretive frame cannot be invoked to legitimize technophobic postures within contemporary educational practice. On the contrary, a refusal to engage in systematic inquiry, critical reflection, and ongoing professional development on these matters

constitutes a substantive disservice to learners, insofar as educational agency presupposes a robust understanding of the socio-technical conditions within which it operates (UNESCO, 2018).
While critical vigilance toward technological transformation remains both legitimate and necessary, it must be distinguished from unproductive alarmism. A rigorous comprehension of emerging digital ecologies is a prerequisite for their pedagogically responsible navigation (Floridi, 2014). In this regard, it is methodologically and ethically untenable for educators to position themselves as guides to learners within a domain that they themselves are concurrently and unreflectively exploring. Educational responsibility, therefore, entails not only accompaniment but also interpretive competence, epistemic preparedness, and the capacity to situate oneself critically within the very processes one seeks to mediate (Mishra & Koehler, 2006; Freire, 1970).
In response, the contribution proposes training models for teachers and educators grounded in critical media pedagogy, aimed at the "domestication" of technologies within educational contexts. This approach emphasizes the primacy of pedagogical intentionality over technical functionality, aligning with perspectives that advocate for a conscious, situated, and ethically aware integration of digital media in education (Tisseron, 2016; Marangi, 2023; Rivoltella & Rossi, 2019). It also calls for a redefinition of professional formation as a space of critical reflection rather than technical adaptation.
Ultimately, the paper argues that governing the Technium (Cambi & Pinto Minerva, 2023) constitutes a central challenge for contemporary education. Rather than embracing deterministic or solutionist views of technology, educators are called to critically negotiate the relationship between human agency and algorithmic mediation. Reframing educator education in this light means resisting the reduction of education to fabrication and reaffirming its ethical, relational, and transformative dimension. Only by sustaining this tension – rather than resolving it – can education continue to foster autonomy, critical awareness, and meaningful freedom.

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Between Algorithm and Relationship:
The Perceptions of Future Support Teachers on Artificial Intelligence

Melchionna Ettore
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This study explores the attitudes of a sample of approximately 1,000 prospective support teachers towards Artificial Intelligence (AI) using the GAAIS scale. Although participants accept AI as an operational scaffolding tool, they strongly reject algorithmic delegation in professional decisions. Statistical uncertainty about didactic personalization highlights a profound awareness: true inclusion requires human relational care. The contemporary educational horizon is strongly impacted by advanced algorithmic systems, moving towards what Floridi (2025) defines as the onlife condition: an integrated ecosystem in which the boundaries between physical and digital dissolve. Within this framework, teachers face a dual pressure: on the one hand, the technocratic push towards automation, on the other the "Frankenstein complex", understood as an ancestral fear of a technological de-humanization and a marginalization of their role (Lim & Kim, 2024). This tension is particularly evident in special teaching, which is strongly focused on empathy. In fact, didactic interaction requires situated discernment and corporeality (Sibilio, 2020), elements structurally foreign to probabilistic automation. This quantitative, cross-sectional study maps how future graduate teachers navigate the dialectic between technical effectiveness and safeguarding the human core of teaching. The sample is composed of trainee teachers enrolled in university specialization courses in support. Data were collected through the online and anonymous administration of the international General Attitudes Towards Artificial Intelligence Scale (GAAIS) questionnaire (An & Wang, 2025), structured on a 3-point Likert scale (Disagreement, Neutral, Agree). The items were grouped into three macro-dimensions: operational/educational scaffolding, decision-making delegation, and contextual personalization. The data reveal a mature "critical trust," which draws a clear line between the functional utility of the machine and its ethical-relational limits. In terms of operational effectiveness, consensus is high: 62.5% of the sample agrees in using AI to create simulated lessons (Item 18) and 55.6% consider it a valid mediator for simplifying complex concepts (Item 24). AI is accepted as a subordinate assistant to optimize design (Calvani & Menichetti, 2023). On the contrary, a clear reversal of the trend emerges with respect to decision delegation: 62.6% firmly refuse to entrust complex decisions to algorithms (Item 5) and 66.9% refuse pervasive use of AI in every task (Item 10). Teachers reject technological replacement to protect professional autonomy. The most critical issue lies in personalization, where strong neutrality prevails: 41.9% are uncertain about the AI's ability to design tasks based on individual rhythms (Item 22) and 41.3% doubt its ability to decode class context variables (Item 23). This hesitation highlights the awareness that inclusion requires an empathetic care posture that cannot be reduced to a binary logic (Fedeli, 2023). Future teachers thus embrace a framework of "technological humanism" (Cambi, 2025). Rather than a neo-Luddite rejection, resistance to decision-making delegation represents a resource for the ethical stability of the school, reaffirming the primacy of human contact (Rivoltella, 2025). Consequently, university education must move beyond basic digital literacy towards "Critical AI Pedagogy" workshops (Fedeli, 2023). E' it is necessary to train teachers who know how to use AI to automate bureaucratic burdens (Zawacki-Richter & Marín, 2026), so that school professionals can focus entirely on the centrality of educational action, understood as relational care and a caring posture located within the inclusive context.

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Artificial Intelligence as a mediation device: towards an epistemological redefinition of active teaching through the 5E Model

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As Larry Cuban would say (1986), the relationship between technologies and education is characterised by an unstable love affair, in that every technology has historically triggered a recurring cycle of enthusiasm, hope and disillusionment, without transformative promises translating into structural changes in learning processes (Rushby & Seabrook, 2008). Artificial intelligence reproduces this pattern with unprecedented pervasiveness, making a critical stance all the more urgent. If no technology is neutral (McLuhan, 1964; Postman, 1992), AI does not add a tool to the didactic repertoire, but reconfigures the environment, roles and relationships. Quattrociocchi and colleagues (2025) define "epistemia" as the user's tendency to receive the fluent and convincing outputs of generative systems as acquired knowledge, without the cognitive work of reasoning. Linguistic plausibility is confused with epistemic soundness, a phenomenon that Petrucci and Ranieri (2025) describe as epistemic overconfidence. Recognising this risk does not mean abandoning the integration of AI in educational contexts, but redefining the conditions under which it can become a tool for authentic and transformative learning.

The chosen interpretive framework is Roger W. Bybee's BSCS 5E model (2014; 2015), rooted in the constructivist perspective and articulated in five sequential and cyclical phases — engagement, exploration, explanation, elaboration and evaluation — with the aim of activating students' prior knowledge, generating cognitive conflict and gradually leading from concrete experience to formal conceptualisation and metacognitive elaboration. Using artificial intelligence as a tool of pedagogical mediation recalls the hermeneutic tradition of Gadamer (1960) and Ricoeur (1989). To mediate does not mean to transmit content but to open a symbolic space in which understanding is produced through the encounter of different horizons of meaning. The educational relationship is redefined along triadic lines: student, intelligent system and physical-digital context coexist in a dynamic network of interactions (Lizio et al., 2025). In this configuration, the teacher is not a residual figure but the necessary condition for the triad to produce authentic learning, safeguarding the pedagogical intentionality of the process and attending to the affective and metacognitive dimensions that no adaptive system is capable of replicating (Minerva & Fornasari, 2025).

Against this backdrop, three structural criticalities remain. The first is the efficacy paradox: the more AI amplifies the didactic process, the more it risks normalising algorithmic delegation and rendering the teacher's direction opaque. The second concerns the persistence of the risk of epistemia even within the integrated environment, which calls for specific teacher training capable of recognising its signals and restoring the conditions for authentic epistemic judgement. The third concerns teacher training itself, which remains fragmented and lacking a coherent theoretical-pedagogical framework (Dicataldo et al., 2025): the task is not to teach the use of algorithmic tools, but to foster critical reflection on the epistemologies that underpin them. The AI-mediated 5E model preserves cognitive conflict and intersubjective negotiation as conditions for deep learning, confirming that dialogue and creativity are human processes that AI can amplify but not replace (Haase & Pokutta, 2024). As Plato already sensed in the Phaedrus (ca. 370 BCE), the difference between one who truly knows and one who possesses the appearance of knowledge lies in the quality of the path that leads to understanding, not in the quality of the output.

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Human Agency First: Educators as Co-Designers of Educational AI Tools

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This contribution outlines a conceptual and design-based proposal for educators to lead the pedagogical design of generative AI while keeping human agency at the center. As custom AI assistants become increasingly accessible, educators could guide students through participatory design sessions in which they co-create classroom assistants inspired by Socrates, Plato, and Aristotle and use them in educator-led sessions. These assistants function as pedagogical characters for exploring viewpoints, questioning assumptions, and making AI's logic, limits, and risks visible. The proposal is grounded in Laurillard's Conversational Framework, which frames learning as an iterative human-led process of dialogue, prompting, testing, feedback, and reflection, and which structures both the design of the assistant and the classroom sessions. Within this frame, educators act as AI curators and guardians who support critical thinking, AI literacy, and ethical responsibility.

Laurillard invites educators to experiment with new technologies rather than remain their end users, treating teaching itself as a design science (Laurillard, 2012). Her concern is that technologies usually enter education designed for commercial purposes rather than pedagogy first, so their value lies not in the tool alone but in the learning situation designed around it (Laurillard, 2012, 2013). This argument applies directly to today's AI tools, and is precisely why educators should lead in designing them for their own and their students' needs. Socrates 3.0, a custom GPT assistant prototype initially built and tested, is therefore not a ready-made chatbot or a replacement for teaching, but a pedagogical artefact shaped through a human-led process that evolves during the class.

Mollick and Mollick (2023) propose educational roles for AI, emphasizing that students should remain actively in the loop by critically assessing AI outputs. Their notion of AI as a simulator can be extended to philosopher-inspired assistants as simulated practice environments for questioning, argumentation, perspective-taking, and ethical reflection. However, many students may lack the AI literacy needed to question and evaluate these systems. Reviews of AI in higher education show dominant technical perspectives, limited educator involvement, weak links to pedagogical theory, and insufficient reflection on ethical risks (Zawacki-Richter et al., 2019). This supports involving educators as pedagogical actors who can question, adapt, and co-design AI systems.

Related work shows that prompt-based use of the free version of ChatGPT can create Socratic dialogue interactions for students (Appadoo-Ramsamy, 2025), while Socratic dialogue with generative AI has also been explored in academic writing (Leoste et al., 2025). This proposal differs by focusing on the participatory design of custom philosopher-inspired GPT assistants as pedagogical artefacts, built through the paid custom GPT functionality using preconfigured instructions and uploaded knowledge files. Rather than centering on one Socratic assistant, student groups can develop multiple pedagogical characters, such as Socrates, Plato, Aristotle, or other figures relevant to the learning context. Socrates 3.0 is an initial example of this broader approach. The proposal also does not idealize the traditional Socratic method. Laurillard critiques Socratic dialogue when it becomes a one-sided rhetorical strategy that gives most agency to the teacher and does not sufficiently reveal learners' own conceptions (Laurillard, 2013). The aim is therefore not to reproduce Socratic teaching, but to co-design philosopher-inspired assistants and set them in dialogue within a broader human-led learning process.

In the proposed class, educators guide students through participatory design sessions (Bødker & Kyng, 2018) that face the big issues of AI integration in education. Socrates 3.0 is introduced as a working prototype that students and educators shape by defining its role, boundaries, and prompts. This is essential because AI's "capability uncertainty" means its design possibilities and limits only

become clear through situated, iterative interaction. By treating students as protagonists rather than passive end-users, the assistant becomes a tool for them to test assumptions, compare viewpoints, and exercise democratic control over AI in their learning environment. Actively involving users is crucial for navigating AI's "output complexity," the open-ended and adaptive nature of its responses (Yang et al., 2020). The philosopher personas make multiple perspectives available while opening discussion about simulation, anthropomorphism, and whose values and cultural assumptions a model may reproduce (Atari et al., 2023).

The class is structured around Laurillard's six learning types: acquisition, inquiry, discussion, collaboration, practice, and production (Laurillard, 2012). In the acquisition stage, students encounter introductory content about ancient philosophers, LLMs, custom GPT assistants, and how to construct effective prompts and instructions for a custom GPT. In the inquiry stage, they explore how different philosophers questioned knowledge and how existing AI assistants work. They then move into discussion, where they address anthropomorphism, digital twins, data privacy, ethics, and the importance of keeping a human in the loop. In the collaboration stage, students are divided into small groups, with each group designing one GPT philosopher assistant. They then move into practice by testing, revising, and exploring the GPTs they have built. The final stage is production, where each group presents its GPT assistant, similarly to a hackathon format. The final GPT assistants are then brought into dialogue with one another, while the teacher facilitates the confrontation between different AI philosophers and students from the different groups.

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University Professors' Favorable Disposition Toward AI-Based Diagnostic Assessment

Nuzzaci Antonella

The integration of Artificial Intelligence (AI) systems into the higher education landscape has triggered a global epistemological, ethical, and methodological debate (Crompton & Burke, 2023). If, on the one hand, technological innovation offers unprecedented tools for the optimization of teaching-learning processes, on the other hand, it raises profound cultural and pedagogical resistance within the academic community. The most deep-rooted concern in the scientific literature lies in the latent risk of a "dehumanization" of teaching, i.e. in a progressive and uncritical mechanization of the evaluative act that threatens to reduce the student to a mere cluster of quantifiable data (Selwyn, 2019; Williamson, 2017). Evaluation, historically understood as a fundamental relational, axiological, heuristic and interpersonal device between teacher and learner, risks being perceived as an alienating and aseptic process when it is mediated by complex algorithms of massive computation.

This paper analyzes the transition from traditional to AI-assisted evaluation models, focusing specifically on diagnostic assessment. In today's university contexts, which are increasingly characterized by classrooms that are increasingly heterogeneous in terms of students' socio-cultural and educational backgrounds, the timely diagnosis of prerequisites is an essential factor in ensuring the equity and effectiveness of the course of study.

The transition to diagnostic AI must not constitute a technocratic drift or a weakening of the intellectual role of the teacher, but can represent, on the contrary, an extraordinary opportunity for didactic renewal and personalization of pathways. The crucial element to determine the success or ethical-methodological failure of this transition lies in the strategic training of the teaching staff and in the construction of their conscious favorable disposition towards these tools. In this sense, the essay analytically maps the evidence and repercussions that have emerged from international and national literature:

Scope of Analysis	Highlighted Resistances and Constructs	Impact and Results
Contesto Internazionale	The acceptance of AI is linked to the perception of educational usefulness and the reduction of technophobia. If the algorithm is experienced as an inscrutable “black box”, it generates barriers and widespread rejection	When professors understand the probabilistic and non-dogmatic nature of the algorithm, attitudes toward the tool shift radically from a defensive posture to a collaborative logic
Italian context	There is structural and ideological resistance to automation processes, perceived as a threat to the freedom of teaching or to the personalization of the educational relationship	Faculty Development courses empirically demonstrate that targeted training interventions enable teachers to make a critical and conscious use of data
Focus: Educational Needs	Tendency towards bureaucratization of performance and quantitative flattening	Overcoming quantitative bias: trained teachers use Learning Analytics as teaching “magnifying glasses” to intercept submerged needs (working students, non-attending students, fragile backgrounds)
Focus: Teaching Time	Overload of the teacher in standardized evaluation tasks administered “on a blanket basis” at the beginning of the courses	Strategic requalification of time: pre-processed data reduces correction times, allowing exam programs to be remodulated, lessons calibrated and just-in-time laboratories activated

Table 1. Research evidence and impact of Faculty Development

Educational research converges in demonstrating that a favorable disposition of the teacher — built not through isolated technical training, but through organic training that integrates technological, didactic and reflective skills — is the only real catalyst capable of transforming AI diagnostic data from cold statistical indicators to propulsive elements for truly inclusive teaching oriented towards the educational success of all students.

Predictive Diagnostic Evaluation and Countering Dropout

Diagnostic assessment is strategically placed in the initial stages of the university experience or at the start of specific curricular modules, with the explicit aim of mapping previous skills, unresolved conceptual knots and potential cognitive barriers that could hinder students' learning. In contemporary academic contexts, the effectiveness of this fundamental teaching practice has been limited by the difficulties for teachers to personalize the observation and timely intervention on cohorts of hundreds of students in time useful for the effectiveness of the teaching action.

In this complex scenario, Learning Analytics (LA) systems and AI applied to diagnostics intervene not as substitutes for human action, but as real amplifiers of the perceptive, interpretative and decision-making skills of the university professor (Siemens, 2013; Viberg et al., 2020). Through the predictive processing of complex behavioral and academic patterns — such as the frequency and quality of interaction with Learning Management Systems (LMS), the time taken to use the digital materials made available and the historical outcomes of intermediate training micro-assessments — AI is able to support teacher action on two crucial fronts for the academic survival of the student, as shown in Table 2.

Intervention	Pedagogical objective	Operating mechanism
Early identification of learning gaps	Early detection of specific conceptual and information gaps	It intercepts cognitive criticalities before they settle irreversibly, preventing consolidated failures in the academic path
Prevention of academic dropout	Countering the risk of early university dropout of cohorts	Develop complex mathematical models by generating automatic early warning systems. Allows the subsidiary activation of personalized tutoring and targeted support

Table 2. Diagnostic AI strategic action fronts

The first front concerns the early identification of learning gaps, i.e. the timely detection of specific conceptual and information gaps before they settle in a completely irreversible way in the subject's cognitive framework. In this way, the intervention of the teacher can precede the structuring of an established academic failure. The second strategic front focuses on the prevention of academic dropout through the generation of complex early warning systems. Based on predictive models, AI is able to automatically report to the teacher those students who show a high statistical probability of dropping out of university (Luckin, 2018). This early identification allows the subsidiary, targeted and timely activation of personalized tutoring measures, specific guidance and tailor-made supplementary teaching supports. The predictive algorithm, therefore, does not replace the teacher's autonomy of judgment, but directs his clinical action, finally making visible submerged criticalities within the critical mass of students.

Teacher Training as Cognitive and Affective Scaffolding

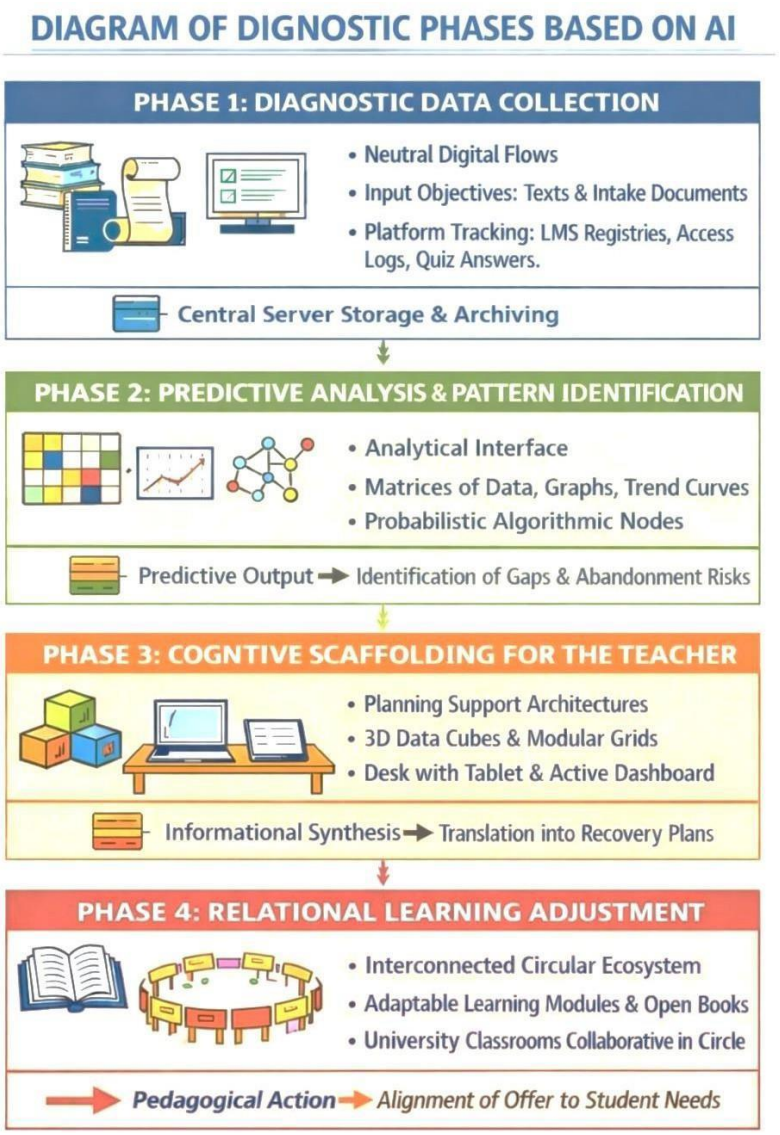
In order to definitively undermine the widespread perception of AI as a "threatening agent" aimed at depriving the sensitivity and intellectual authority of the teacher, it is essential to intervene systematically on the professional culture of the academic body. The training of university teachers is now configured as a priority strategic lever to promote a real and advanced digital literacy and overcome the widespread phenomena of institutional technophobia (Mishra & Koehler, 2006). The

training models proposed within universities must not be limited to mere technical-instrumental

training or mechanical learning of the use of software, but must necessarily be grafted onto a deep and continuous pedagogical, ethical and relational reflection (Chai et al., 2021).
The fundamental objective of these paths of professional development of university professors lies in the conceptual reconfiguration of AI, which must be repositioned in its transition from a disturbing and bureaucratic element to a powerful cognitive and affective scaffolding, taking up and declining the historical theoretical matrices of social development and learning of Vygotskij (1978) and Bruner (1983) applied to today's digital ecosystems, according to the conceptual synthesis proposed in Table 3.

Type of Scaffolding	Specified Teaching Function	Psychological and Professional Impact
Cognitive Scaffolding	It supports superior mental functions and programming skills in the organization, synthesis and interpretative reading of large amounts of data (Big Data)	Translates computational complexity into clear didactic information, which can be used in the structuring of differentiated remediation paths for small groups or individual students
Affective Scaffolding	Unravel the inner workings and probabilistic logic of the algorithm through built-in digital literacy	It mitigates replacement anxiety and develops a strong sense of self-efficacy. It allows you to welcome technology as an ally for the educational success and well-being of the student
Metacognitive Scaffolding	It feeds the teacher's critical reflection on their teaching strategies, highlighting deviations between the planned objectives and real learning	Develops an aptitude for action-research and didactic flexibility. The teacher learns to consider the data not as a judgment, but as a resource for professional self-evaluation
Relational Scaffolding	It relieves the teacher of standardized and bureaucratic tracking, optimizing the time for educational mediation, pedagogical dialogue and qualitative feedback	Reconfigure the educator's identity from content provider to mentor. Strengthens the ethics of relational care and increases job satisfaction in interacting with students

Table 3. Dimensions of algorithmic scaffolding in teacher training



Reconfiguration of the Pedagogical Relationship and Personalization of Education

The virtuous paradox highlighted by the research lies in the fact that the automation of diagnostic processes does not distance the teacher from the student, but on the contrary favors and enhances their human approach. Relieved of the routine, fragmented, mechanical and chronophagous tasks of massive correction and manual tracking of gaps, the university professor regains that precious capital indispensable time to exercise his authentic and irreplaceable function: the care of the educational relationship, active listening and dialogic interaction with students (Biesta, 2015).

The favorable disposition of the teacher, appropriately structured by the training, transforms the raw quantitative data generated by the algorithm into an element of deep didactic awareness and design flexibility. Knowing in advance and with scientific precision the specific needs of students, their strengths and their structural weaknesses at the entrance to the educational process, the teacher can reshape the design of content and strategies in real time, calibrating the delivery of lectures, laboratories and seminars according to the real needs intercepted in the classroom. Education is thus aligned in a millimetric way with the real training needs of students, achieving a personalization of learning on a large scale without losing the community dimension of the classroom and corresponding, in an increasingly targeted way, the training action to the specific needs of each student.

Conclusions and Future Perspectives

In conclusion, the study amply demonstrates that the conscious adoption of AI in the field of diagnostic evaluation does not at all decree the decline of humanistic pedagogy or the role of the teacher, but requires a critical, mature and conscious evolution. The construction of a favorable disposition in university professors represents the essential academic and cultural conditio sine qua non to transform technology from a potential risk factor to an inclusive resource. Only through systemic, continuous and structural investments in the pedagogical-digital training of the teaching staff will it be possible to ensure that the algorithm remains strictly a support tool subordinate to the educational intentionality of the teacher, ensuring the development of a university of the future capable of combining the scientific efficiency of data with the ethics of relational care.

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AI and Gamification for Inclusive and Engaging Learning: A Preliminary Scoping Review

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In the current educational landscape, Artificial Intelligence (AI) and gamification are progressively redefining the methods used to design and evaluate learning environments. This contribution proposes an exploratory scoping review aimed at mapping recent literature (2023–2026) on this integration, analysing its implications for inclusion, the personalization of learning pathways, and the transformations of the teacher's role. Furthermore, this study aims to move beyond a merely instrumental view of technological and didactic innovation, framing AI and gamification as educational mediators that require intentional design and methodological coherence regarding the relational and affective dimensions of educational practice.

Theoretical Framework

The theoretical framework is structured around three conceptual nodes: AI as a tool for adaptation (through intelligent systems, learning analytics, and generative models); gamification as a lever to promote motivation, active participation, and cognitive engagement; and inclusion as the central interpretive lens. The integration of these devices is configured as an intentional design in which AI makes game elements (such as challenges, feedback, and progression) dynamic and flexible in response to each student's specific needs. Inclusion, interpreted through the lens of Universal Design for Learning, requires that personalization be attentive to contexts and full community participation. The teacher's role emerges as crucial, as they are called upon to mediate the use of technology, avoiding the risk that motivation is reduced to automated reward mechanisms.

Methodology

The study adopted the scoping review methodology to investigate a rapidly evolving field. Using the PCC (Population, Concept, Context) framework, the following research question was formulated: "What emerging evidence exists on the integration of AI and gamification in education in terms of engagement, personalization, and inclusion?" The research, conducted on Scopus, selected English-language contributions (2023–2026), applying PRISMA-ScR criteria to ensure transparency and reproducibility. After a double-blind selection process, the final corpus included 45 studies.

Results and Discussion

The analysis highlights an exponential growth in scientific interest starting from 2025. The majority of the literature (71.1%) consists of empirical studies exploring the effectiveness of hybrid environments, with a prevalence of interventions aimed at secondary education.

A critical finding emerges regarding the modes of integration:

In 19 studies (42.2%), the technologies are genuinely integrated, with AI dynamically modulating game mechanics to adapt to the student's profile.

In 11 studies (24.4%), AI and gamification are simply placed side-by-side, depriving the intervention of a true pedagogical synergy.

The remaining portion includes theoretical studies or cases where gamification serves as a tool for AI literacy.

The results indicate that effective integration supports behavioural, cognitive, and emotional engagement. However, technological innovation does not automatically generate didactic innovation: effectiveness lies in the ability to design meaningful experiences, avoiding uncritical use by students and reflecting on the professional competencies necessary for teachers to guide these processes in an ethical and informed manner.

Conclusions and Perspectives

The research confirms that the integration of AI and gamification represents a promising field that is still in the phase of consolidation. The challenge for schools lies in building environments where innovation, equity, and pedagogical intentionality are closely connected. Future perspectives suggest delving into the impact of these integrations on students with special educational needs, promoting an inclusive personalization that values every student's participation in the learning community. This work provides an initial conceptual map useful for informing future empirical research and both initial and in-service teacher education.

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Media education, digital literacy, and teacher education: pedagogical perspectives on the critical construction of meaning in digital contexts

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The emergence of generative artificial intelligence is profoundly reshaping the relationship between knowledge, education, and society, prompting pedagogy to reconsider the ways teaching and learning are understood. The educational challenge extends beyond the introduction of innovative technologies into schools and concerns the processes through which knowledge is produced, interpreted, organized, and shared. As highlighted by UNESCO (2023), artificial intelligence represents one of the major educational challenges of our time because it actively influences the construction of meaning and transforms the forms of cultural mediation traditionally performed by schools. Consequently, the central issue is not whether AI should be embraced or rejected, but how it can be integrated into pedagogical practices that foster critical thinking and digital citizenship.

The evolution of digital environments demonstrates that access to information no longer guarantees knowledge construction. AI systems increasingly select, organize, and generate content, influencing how individuals interpret reality, develop opinions, and participate in cultural life. This requires moving beyond a purely technological view of educational innovation and focusing instead on the cognitive, ethical, and relational dimensions of learning. As Floridi (2022) argues, artificial intelligence reshapes the informational environment in which knowledge is created, making critical pedagogical reflection essential.

Within this context, digital literacy must be reconsidered. Traditionally associated with the technical use of digital devices and platforms, it now encompasses higher-order competences, including the ability to understand algorithmic systems, critically evaluate AI-generated information, recognize potential biases, and reflect on the ethical and social implications of intelligent technologies. The DigCompEdu framework reflects this perspective by defining digital competence as an integral component of teachers' professional practice and pedagogical design (Redecker, 2017).

At the same time, media education acquires renewed significance. Originally conceived as an educational approach promoting critical understanding of media languages and representations (Buckingham, 2003), it must now address environments in which algorithms actively contribute to knowledge production. Media education should therefore move beyond teaching the responsible use of digital technologies and become a pedagogical framework for understanding how meaning is constructed, negotiated, and transformed within digital contexts.

Within this framework, teacher education plays a strategic role, as educational innovation depends on teachers' ability to critically interpret technological change and translate it into meaningful pedagogical practice. Initial and continuing teacher education should move beyond the acquisition of technical skills and foster reflective professionals capable of designing learning environments where artificial intelligence supports autonomy, participation, and critical awareness. Teachers are not expected to compete with algorithms in producing information; rather, they are called to mediate knowledge, enabling students to interpret, question, and contextualize AI-generated content.

This perspective highlights the close relationship between media education, digital literacy, and teacher education. While digital literacy provides the competences needed to engage effectively with digital environments, and teacher education develops the professional expertise required to integrate such competences into educational practice, media education offers the pedagogical framework through which these dimensions acquire critical meaning. Its purpose is no longer limited to promoting the responsible use of digital technologies, but extends to helping learners understand how digital

environments organize, prioritize, and disseminate information. This involves evaluating the reliability of AI-generated content, comparing multiple sources, and engaging in critical dialogue and reflection (Rivoltella, 2020).

From this perspective, the critical construction of meaning represents the conceptual link connecting media education, digital literacy, and teacher education. Learning cannot be reduced to the passive consumption of information or delegated to algorithmic systems. Instead, it remains a relational and reflective process in which teachers play an essential mediating role. Although artificial intelligence can efficiently generate content, schools remain responsible for enabling students to critically interpret information, recognize its limitations, and transform it into meaningful knowledge through inquiry, discussion, and shared reflection.

Artificial intelligence should therefore be understood not as the final stage of educational innovation but as an opportunity to reaffirm the central role of pedagogy in contemporary education. The challenge is not simply to adapt teaching to technological change, but to guide this transformation through pedagogical approaches that integrate digital competence, ethical responsibility, and critical thinking. From this perspective, media education provides an essential framework for supporting the critical construction of meaning in digital contexts and for preparing informed, responsible, and critically engaged citizens capable of navigating the complexity of contemporary society.

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Teaching in the age of AI: Mapping pre-service special education teachers' orientations between resistance and fascination

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The rapid diffusion and growing pervasiveness of artificial intelligence (AI) in educational contexts are transforming how teaching and learning are designed, mediated, and experienced. Beyond offering tools for content generation, personalization, and access to resources, AI raises important questions about the conditions under which educational environments can remain meaningful and accessible (Holmes et al., 2019). This issue is particularly relevant in inclusive and special education, where teachers must respond to diverse needs through flexible, differentiated, and pedagogically intentional approaches. From this perspective, the educational potential of AI depends less on the technology itself than on how teachers perceive, interpret, and integrate it into professional practice (Fiorucci, Bevilacqua, 2026).

Within this framework, the present study examined pre-service special education teachers' orientations toward AI in teaching-learning processes, considering a set of acceptance-related, motivational, emotional, and professional factors (Ofem et al., 2025; Lamacchia et al., 2025). A quantitative design was adopted, with data collected through a structured questionnaire administered to 616 Italian teachers enrolled in a specialization program for special education support. The study examines the relations among perceived usefulness (PU), perceived ease of use (PEOU), and behavioral intention to use AI (BI), along with AI-related anxiety, technophobia, perceptions of AI for social good, intrinsic motivation, self-efficacy, and professional concerns, and tested the structural invariance of these relations across generational cohorts (Gen Z, Millennials, and Gen X).

The results highlight a complex pattern of AI acceptance. Perceived usefulness (PU), perceived ease of use (PEOU), and behavioral intention (BI) were positively related, indicating that willingness to integrate AI into instructional practice was closely associated with perceptions of its usefulness and operational accessibility. Motivational factors - particularly intrinsic motivation, self-efficacy, and the perception of AI as a tool for the common good - were positively associated not only with perceived usefulness and ease of use, but also with the behavioral intention. Conversely, psychological and professional resistance factors were negatively associated with AI acceptance, with concerns regarding technical competence, professional replacement, the opacity of AI systems, and students' excessive dependence on AI emerging as the dimensions most closely linked to teachers' attitudes toward AI. The relations did not differ substantially across generational cohorts, suggesting that AI acceptance cannot be primarily attributed to generational differences. Openness toward AI was associated with intrinsic motivation, self-efficacy in the use of AI systems, and the perception of AI as a tool oriented toward social good, while sociotechnical blindness and concerns that AI may be linked to cycles of dependence among students and reduced critical thinking skills were the factors most closely associated with resistance toward AI, in relation to both perceived usefulness and perceived ease of use (Gallese, Moriggi, Rivoltella, 2025). Pre-service special education teachers thus appear more willing to engage with AI when they recognize it as a resource coherent with their professional role and with the aims of inclusive education. At the same time, their concerns highlight the need to distinguish clearly between support and substitution: AI can become a resource for inclusive teaching only when it expands access without impoverishing the formative complexity of learning tasks, supports cognitive and metacognitive processes without replacing them, and sustains autonomy without producing new forms of delegation.

The study contributes to current debates on pre-service and in-service teacher education by providing empirical evidence on how future special education teachers approach AI and by emphasizing the

need for critical, informed, and context-sensitive training pathways in inclusive educational settings (Perla, Fabris, 2025). Teacher education should not be limited to operational skills or familiarization with AI tools; rather, the findings suggest the need to reconsider the instructional design of teacher education programs, particularly Information and Communication Technologies (ICT) related modules, so that they may support the development of a reflective professional stance toward technological innovation. This means helping prospective teachers interpret AI systems, assess their educational relevance, recognize their limits, and integrate them into instructional design according to pupils' needs and the aims of inclusive education. AI can therefore become pedagogically meaningful only when it is situated within the broader domain of didactic mediation (Galli, 2025), where technology is not adopted as an end in itself, but critically questioned, selected, and oriented by conscious professional intentionality.

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A Teacher Training Model for the Age of AI.
Integrating Critical Use and Relational Competences

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The spread of artificial intelligence (AI) in educational settings is transforming teaching, learning and the design of school environments (European Commission, 2022; UNESCO, 2023). Alongside the opportunities, questions have emerged regarding the teacher's educational role, which is often overlooked by approaches that focus primarily on AI literacy (Isma'il & Ibrahim, 2025). Against this backdrop, this paper proposes a teacher training model that integrates digital, interpersonal and interpretative competences.

The literature highlights how teachers' attitudes towards AI depend not only on their technological skills, but also on the conceptions that shape their professional practice (Cabero-Almenara et al., 2024). Content-transmission approaches tend to be associated with greater resistance to such technologies, whilst perspectives more focused on interpersonal relationships and constructivism interpret them as tools to support learning (Chan & Tsi, 2024). Concerns regarding the spread of AI therefore involve not only technical aspects but also issues of identity linked to the meaning attributed to teaching (Puja et al., 2025).

The literature also suggests that teaching is a complex practice that cannot be reduced to the transmission of knowledge (Carnero, 2023). Teacher professionalism, in fact, involves interpretative, embodied and interpersonal competences necessary to understand the complexity of contexts and build meaningful relationships with pupils (Macedonia, 2019; Maccario, 2024). These dimensions are particularly relevant for special needs teachers, who are required to interpret the needs and aspirations of their pupils from a bio-psycho-social (WHO, 2001) and ecosystemic (Bronfenbrenner & Morris, 2006) perspective, promoting inclusive pathways through collaboration with families and professionals (Dusi, 2022).

Building on these premises, a training model is proposed that integrates AI literacy and professional skills. AI can support classroom observation through the transcription and analysis of interactions, inclusive instructional design through the adaptation of learning materials, ecosystemic analysis by mapping educational networks, professional collaboration through automated meeting summaries, reflective practice through the analysis of reflective journals, and communication with families through message reformulation. These possibilities broaden teachers' professional repertoire, whilst leaving the interpretative and ethical dimensions of educational practice to the teacher (Huang, 2023).

The proposal assumes that teacher training in the age of AI cannot be limited to the technological dimension, but must include relational, interpretative and ethical aspects. Particular attention must be paid to the risks associated with digital inequalities, algorithmic bias, the protection of personal data and the delegation to technology of functions specific to the teaching profession (Huang, 2023; Puja et al., 2025). Within this framework, AI is interpreted as a tool to be used critically within the context of digital affective literacy (Tekeli, 2026). As this is a theoretical-conceptual model, future research will be required to operationalise it and empirically verify its effectiveness.

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Innovative language teacher education approaches integrating ai-assisted models

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The rapid diffusion of artificial intelligence within educational environments is profoundly reshaping language teaching. Language teachers are increasingly expected to operate in digitally mediated environments and to integrate technological tools into their pedagogical practice (Godwin-Jones, 2022). Yet resistance remains widespread. Without adequate training that addresses both the technical and pedagogical dimensions of AI use, hesitation is a predictable and, in many respects, rational response. The literature confirms that resistance to AI adoption stems from a structural deficit: limited preparation, insufficient theoretical grounding, and the absence of models that connect technological tools to principled language pedagogy (Godwin-Jones, 2022; Kovačić & Bubaš, 2023).

This challenge is particularly acute in LSP education, where language learning is inseparable from disciplinary discourse, professional communication, and context-sensitive language use. Specialized discourse cannot be reduced to automated linguistic processing, and teachers who lack a robust pedagogical framework struggle to evaluate what AI tools can and cannot do within their specific instructional contexts.

Language Awareness as a Theoretical Response

Language Awareness (LA) provides a grounded framework for rethinking teacher education in the context of AI integration. Rooted in Hawkins' (1984) foundational work and developed across metacognitive, critical, and multilingual dimensions (James & Garrett, 1991; Van Lier, 1995), LA foregrounds the learner's and teacher's conscious understanding of how language functions as a system, a social practice, and a tool for meaning-making. In teacher education specifically, LA has been reconceptualized as a professional competence: the capacity to reflect on language not only as subject matter but as a medium of epistemic and cultural negotiation (Andrews, 2007).

This orientation is directly relevant to the question of AI resistance. Teachers who lack an understanding of language and learning are poorly positioned to evaluate AI tools critically. LA, by developing reflective and critical engagement with language, equips educators to interrogate AI-generated content critically. The cognitive, affective, and critical dimensions of LA (Svalberg, 2007) translate directly into the competences needed for responsible AI integration: analytical awareness, contextual sensitivity, and ethical judgment.

The AILEM Project

The AILEM project (AI-Infused Language Education: Empowering Teachers through Multilingual MOOC Training) is an Erasmus+ cooperation initiative led by Pegaso Telematic University, funded under program KA220-HED (Project No. KA220-HED-D6888EC3) and implemented from September 2024 to August 2027. The consortium includes six partners from four European countries: Adam Mickiewicz University (Poznań), Burdur Mehmet Akif Ersoy University, Josip Juraj Strossmayer University (Osijek), SmartEd srl (Naples), and ZSI SIGID Sp. z o.o. (Poznań), combining expertise in language education, instructional design, digital pedagogy, and professional training.

The project addresses the critical gap between the growing availability of AI tools in education and teachers' limited preparedness to integrate them in pedagogically grounded, critically informed ways. Its objectives are: to enhance teachers' AI literacy and digital competences; to promote innovative LSP instruction supported by AI; to foster critical awareness of AI opportunities, limitations, and ethical implications; to support multilingual and intercultural approaches; and to strengthen collaboration across educational and professional stakeholders.

The central output is an open-access multilingual miniMOOC available in five languages (English, Italian, Polish, Croatian, Turkish), designed primarily for LSP educators in higher education, vocational training, and adult education. The pedagogical model draws on connectivism (Siemens, 2005) and the miniMOOC format (Jansen & Schuwer, 2015), combining theoretical foundations, practical demonstrations, collaborative activities, and structured reflection. The course follows a dual-track structure: one pathway for educators focusing on pedagogical integration, instructional design, and classroom implementation; a second for professional stakeholders interested in AI-driven innovation in language-related sectors.

Successful participants receive microcredentials and digital badges aligned with the European Qualifications Framework (Cedefop, 2017), supporting professional recognition and portability of competences.

Conclusions

Teacher resistance to AI in language education is best understood not as technophobia but as a symptom of structural underpreparedness. Effective integration requires moving beyond the binary of adoption versus refusal toward a reflective, theoretically grounded engagement with what AI tools can and cannot do within specific pedagogical contexts. LA offers a generative framework for this reorientation, and the AILEM project operationalises it through a multilingual, connectivist teacher education model designed for the realities of contemporary higher education.

Future work will include empirical evaluation of participant outcomes and investigation into how AI literacy can be more systematically embedded in language teacher education across European contexts.

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The Coordinating Tutor as an Emotional Compass:
Reflective Mentorship to Overcome the 'Frankenstein Complex' in Teacher Training Programmes.

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In Italy, the rapid spread of GenAI has transformed the educational landscape, offering new tools for designing teaching and personalizing learning, yet creating deep unease within the teaching community. A specter is haunting teacher training: on the one hand, 'humanoid fundamentalists' fear dehumanization and the loss of the human role; on the other, the uncritical enthusiasm of the so-called 'D-Generation' is pushing towards total automation. It is within this framework that the training program at Pegaso University operates, having designed an indirect placement program that allows these new tools to be explored both critically and emotionally. The Coordinating Tutor, far from merely performing a bureaucratic supervisory role, acts as a reflective and empathetic mediator, essential to the success of this process.

Theoretical foundations: Reflective mentorship and the Frankenstein Complex

This training program is based on key theories by D. Schön, which emphasize the importance of 'reflection in the course of action' and 'reflection on action' for teachers' professional development. Today's challenge lies in managing uncertainty and complexity through continuous re-evaluation, which forms part of J. Mezirow's framework of transformative learning: adult education must be linked to a profound renewal of perspectives through dialogue and critical discussion. It is L. Shulman who highlights how effective teaching requires the development of 'Pedagogical Content Knowledge', which must necessarily include technical and interpersonal skills. In contemporary schools, the 'Frankenstein Complex'—the historical fear that the technological creation will surpass and replace its human creator—manifests as the teacher's anxiety about losing value, about being 'mutilated' by succumbing to a mechanical and passive use of AI. As noted by P.C. Rivoltella, it is essential to develop an ethic of responsibility and transparency, where the algorithm becomes a device for 'symbolic mirroring', capable of reflecting the teacher's skill and intent.

Methodology and digital tools used

The empirical research involved three groups of trainees from the regions of Sicily and Basilicata and their coordinating tutors. At the heart of the experience was an indirect training module focused on collaborative instructional design with AI support. Three main tools were adopted:

NotebookLM for the analysis and critical synthesis of complex documents and regulatory materials, including the AI Act;

Gems by Gemini, customize chatbots created to simulate dialogues and pedagogical responses;

Raina by Magic School AI, dedicated to the creation of assessment rubrics and lesson plans.

To assess the effectiveness of this approach at the end of the course, a structured questionnaire was administered to gauge attitudes and concerns regarding AI, perceptions of tutorial support, and the degree of reflection in the use of the tools.

Results: From fear to informed use thanks to emotional mentorship

The data collected indicate a clear prevalence (84%) of an attitude described as 'informed and guided use', that is, the perception of AI as an ally within a framework of control and awareness on the part of the teacher. Only a minority display strong fears or uncritical enthusiasm. The coordinating tutor plays a decisive role in overcoming emotional and technical barriers. Through emotional scaffolding (validating fears and transforming them into learning), cognitive scaffolding (critical deconstruction

of AI-generated outputs) and affective scaffolding (maintaining an attentive and sensitive human relationship), the tutor transforms the use of AI from reproductive to creative and relational.

Pedagogical implications: The Coordinating Tutor as an Emotional Compass

The tutor becomes an indispensable emotional and professional guide, helping to strike a balance between technological innovation and the preservation of the human heritage of the teaching profession. This role encompasses the emotional regulation of technological shock, ethical and regulatory anchoring, and the promotion of 'digital wisdom'. Hence the machine as a tool with an 'algorithmic heartbeat' to be integrated into the affective and pedagogical dimension. The teacher is not a passive subject or subordinate to it, but a critical and creative actor in the educational process.

Conclusions and Outlook

It is through robust training models, in which the Coordinating Tutor acts as an 'Affective Compass', that future teachers can acquire Digital Affective Literacy, combining methodological rigour with relational sensitivity. Only in this way can the ontology of care be preserved and pedagogical intentionality be valued, ensuring that Artificial Intelligence becomes a valuable ally for education without ever supplanting the human and professional role of the teacher.

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Can care be simulated? teachers' judgments of educational messages in the age of generative AI

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Generative artificial intelligence is increasingly entering educational practice as a tool for producing texts, designing materials and supporting instructional decisions. Its presence, though, does not concern only technical efficiency. It also affects the way educational language is perceived, especially when a message appears empathic, reassuring and pedagogically appropriate. The question addressed in this study is not whether AI can write correct educational responses, but whether such responses are recognized as expressions of care when their authorship is uncertain or attributed to either a teacher or an artificial system. Care is understood here not as emotional tone alone, but as a pedagogical relation grounded in attention, responsibility and situated judgment (Noddings, 2005).

The study adopts an exploratory mixed-methods design with a quantitatively driven structure and an integrated qualitative component. An anonymous online questionnaire was administered to 807 participants enrolled in teacher qualification pathways at Link Campus University. Participants read three educational vignettes differentiated by relational intensity: assessment anxiety, sensory overload in a student with special educational needs, and an evening request for help linked to loneliness and family difficulties. In the project coding, the messages for Scenarios 1 and 3 were generated by AI, while Scenario 2 was human-authored. This information was not disclosed during completion. For each vignette, participants evaluated perceived relational warmth, authenticity, educational responsibility, initial support, boundary maintenance and educational validity under the hypothesis of artificial authorship. They also attributed each message to a human teacher, to AI, or declared uncertainty. Open-ended responses were analysed through reflexive thematic analysis in order to identify the criteria by which participants define educational care and delimit what should not be delegated to artificial systems.

The results show a pattern that cannot be reduced to technophobic rejection or uncritical acceptance. The messages were often judged plausible and useful, especially when they concerned forms of initial educational support. In Scenario 1, agreement was high for relational warmth, educational responsibility and initial support. Scenario 2 remained positively evaluated, but with a less compact distribution of responses. Scenario 3, involving a more vulnerable and relationally exposed situation, produced lower and more differentiated evaluations. The synthetic indicator of relational quality confirmed this progression: Scenario 1 received the highest score, followed by Scenario 2 and then Scenario 3. Differences among scenarios were statistically significant, although effect sizes remained limited, in line with the exploratory nature of the study.

The most relevant finding concerns the role of author attribution. For the same text, evaluations were systematically higher when participants imagined a human teacher behind the message and lower when they attributed it to AI. The human-authored message was also the one most frequently attributed to artificial intelligence. This paradox suggests that, in the current cultural climate, a highly controlled, composed and pedagogically regulated writing style may appear suspiciously artificial. Authorship does not function as an external label added after reading; it enters the judgment and changes the perceived relational value of the text.

The qualitative data clarify this result. Participants associated care with listening, empathy, authenticity, attention to context, personalization, human presence and moral responsibility. AI was recognized as useful for suggesting, organizing or drafting, but not as fully legitimate in occupying the most exposed areas of teaching: the educational relationship, assessment, emotional

accompaniment and decisions involving vulnerability. Educational care, in this sense, does not coincide with the formal quality of a message. It depends on the relationship between words, responsibility and the recognizable presence of someone who assumes the consequences of what is said.

These findings invite a more precise discussion of AI literacy in teacher education (Chan & Tsi, 2024; Prilop et al., 2025). Teachers do not only need to learn how to use generative tools. They need to distinguish between functional support and relational legitimacy, between linguistic plausibility and educational responsibility. Generative AI can produce messages that are useful, clear and even reassuring. It cannot, by itself, guarantee the situated judgment through which educational care becomes trustworthy. The study is limited by its convenience sample, the exploratory use of an original instrument and the vignette-based design. Even within these limits, it opens a relevant line of inquiry: in education, the value of a message is never contained only in its form. It also depends on the authorial presence that readers perceive behind it and on the responsibility that such presence makes possible.

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Teacher education, Artificial Intelligence, educational complexity: empirical evidence and pedagogical perspectives

Tiso Maria
Iannotta Iolanda Sara

This short essay explores the role of intelligent systems in promoting educational processes oriented toward conscious and constructive forms of learning in the infosphere (Floridi, 2014; 2022). The inexhaustible debate on the influence of technology in teaching-learning processes, initiated in the 1950s and 1960s with teaching machines (Skinner, 1958), is currently experiencing a moment of great excitement owing to the pervasiveness of AI. The invisible and deeply rooted fusion of biology, behaviour, and data opens encouraging prospects for future generations. Pedagogical research seeks to support learning processes by identifying strategies suited to teacher and student training, with the aim of promoting and consolidating the critical competencies required for conscious interaction with AI. There is a need to rethink the environments, spaces, and contexts of knowledge co-construction in which human and non-human actors interact and evolve (Latour, 2005).

Since the ultimate purpose of educational work is not "assembly" (Meirieu, 2007), AI must be viewed not as an end but as an instrument of educational action, capable of accompanying human beings through the world. Working with AI in teaching and learning requires design practices that reject oversimplification and both technophilic and technophobic drifts (Gallese, 2025), to promote inclusion, encourage divergent and creative thinking, and prepare future generations to face the challenges of the contemporary infosphere with awareness (Floridi, 2014; 2022). Far from providing mere operational guidelines or "recipes" for use, education must foster the critical competencies needed to engage consciously with AI, promptly identifying empty automatisms and valuing its agentic and generative potential.

Today, the role of the school is expressed through the need to actively guide this contemporary transition, fostering critical judgment and a horizon of global citizenship while safeguarding against ideological rigidities. The introduction of generative AI systems amplifies the complexity of this task, revealing its profound ambiguity. The potential of large language models offers undeniable advantages in terms of differentiating learning pathways, ensuring timely assessment, and producing multimedia content; at the same time, such tools act as mediators of teachers' own professionalism, easing and integrating their work across planning, assessment, and managerial dimensions (Moriggi, 2023).

Conversely, hidden within the fabric of algorithmic systems are the risks of the "fabrication" of human beings - brought into the world and left isolated - of sterile standardization, Normalism, and reductionism, as well as the propagation of bias in datasets and the urgent need to ensure educational equity, human oversight, and data protection (Rivoltella, 2020). The current challenge for education lies in its ability to mitigate the risks associated with AI in the infosphere by promoting critical competencies that establish new dialogical and generative forms of engagement with the non-human.

To this end, an exploratory study was conducted at the University of Salerno aimed at investigating the perceptions, expectations, and levels of awareness of pre-service teachers regarding the use of AI. The objective was to identify useful elements for designing training pathways capable of supporting the development of professional competencies adequate to these ongoing transformations. The findings informed the design of a specific training intervention: the pathway sought to bridge the identified gap between self-reported familiarity with AI and the perceived possession of competencies adequate for its use in educational settings. The aim was to promote pedagogical, critical, and design competencies conducive to the conscious integration of AI into teaching and learning processes.

The connection between the conceptual framework and the empirical investigation reveals a node that is as critical as it is fundamental: pre-service teachers clearly perceive the gap between an abstract or purely "declarative" knowledge of AI systems and the "operational" ability to translate them into

devices of didactic mediation. This gap confirms the persistence of what Meirieu (2007) defines as the "Frankenstein temptation": the risk that educators abdicate their own pedagogical intentionality, reducing themselves to mere "fabricators" of notions or, conversely, to passive executors of standardized technological protocols. Data regarding students' concerns - focused on the impact of AI on the cognitive matrix, the risk of weakening critical thinking, and the propagation of biases intrinsic to datasets - legitimize and justify moving beyond digital literacy in favour of transliteracy (Floridi, 2014; 2022). Promoting transliteracy does not mean training students in the instrumental use of the machine but rather fostering the development of a critical "computational grammar" capable of co-constructing meaning in human-machine dialogue while identifying algorithmic opacities.

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Between Inclusion and Innovation: Pre-Service Special Education Teachers' Pedagogical Attitudes and Professional Co-Agency with Generative AI

Verbicaro Mariagrazia
Oliva Patrizia

Generative AI integration places teacher education at a critical crossroads for support teachers, whose identity is grounded in an ethics of care (Booth & Ainscow, 2008; d'Alonzo, 2017). The AIL framework requires holding the tension between innovation and relational pedagogy (Adamoli et al., 2026), as opposed to uncritical adoption (Chan & Lee, 2023; Williamson, 2024) or the Frankenstein Complex: resistance rooted in fear that AI impoverishes teaching's relational core (Selwyn, 2019). No prior study has jointly examined inclusive attitudes and AI co-agency in TFA Sostegno trainees.

Research Objectives and Hypotheses

The general objective was to examine whether inclusive orientation predicts professional AI co-agency.

(RO1) Profile both constructs through cluster analysis;

(RO2) test their relationship controlling for demographics;

(RO3) test Deprivation as mediator of Concerns–Affordance via bootstrap (Preacher & Hayes, 2008).

H1: Attitudes + Capability/Affordance (Ertmer, 2005).

H2: Concerns + Deprivation / − Positive Sentiment.

H3 : Deprivation mediates Concerns–Affordance.

Method

N = 451 TFA Sostegno trainees (72.9% female; 44.3% no prior support experience); probabilistic cell-based merge linked two online administrations. SACIE-R (Sharma et al., 2008): Sentiments (α = .869), Attitudes (.932), Concerns (.823); 4-point scale. PAIR-S (Adamoli et al., 2026; CFI = .922): Affordance (α = .973), Capability (.890), Deprivation (.836), Positive/Negative Sentiment (.895/.803); 6-point scale. Spearman's ρ, Ward + K-means (k = 4), hierarchical regressions, bootstrap mediation (5,000 resamples).

Results

Typological Profiles

Ward + K-means yielded four profiles independent of all demographic variables (all $p > .40$; Figure 1). Reflective Adopters combine strong inclusive values with the highest AI use and Deprivation , critical rather than naive adoption. Frankenstein Complex trainees show the highest emotional discomfort and lowest AI engagement. Inclusive Non-Adopters , the largest cluster , hold the strongest inclusive values alongside the lowest AI use. The Disengaged show minimal investment in both.

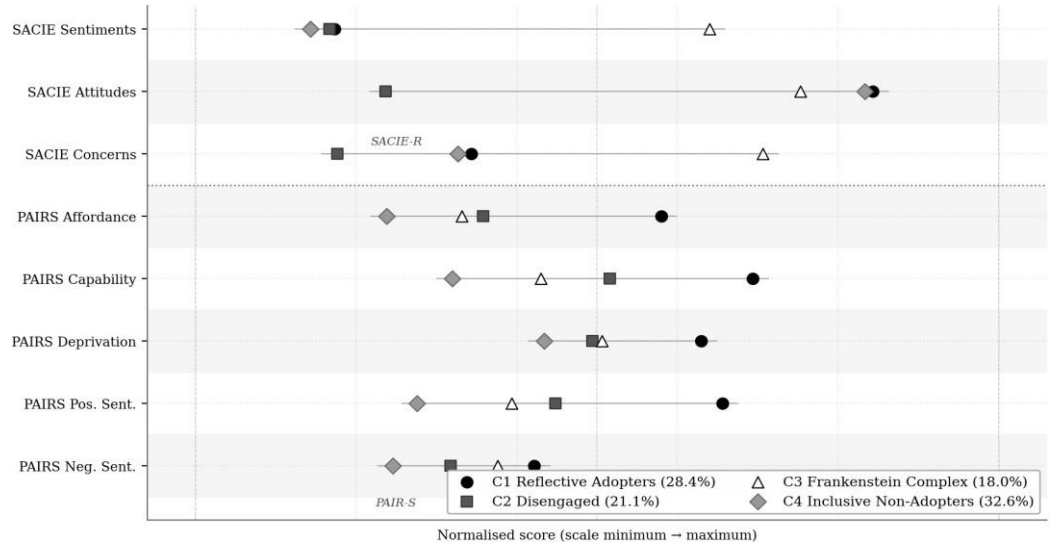


Figure 1. Cluster profiles on SACIE-R and PAIR-S subscales (normalised 0–1, N = 451). Dotted line: PAIR-S/SACIE-R boundary.

Correlations, Regression, and Mediation

Two cohesive but disconnected correlation blocks (Figure 2A): no cross-instrument coefficient was significant (all ρ < .08), disconfirming H1 and H2. No SACIE-R subscale added significant regression variance. Age was the only significant predictor (Figure 2B): Affordance (β = −.139, p = .003) and Positive Sentiment (β = −.095, p = .044) declined with age. Bootstrap mediation disconfirmed H3 (Figure 3): Deprivation inhibits Affordance (Path b: β = .143, p < .01) but Concerns do not activate it (p = .684; CI [−0.012, 0.021] contains zero).

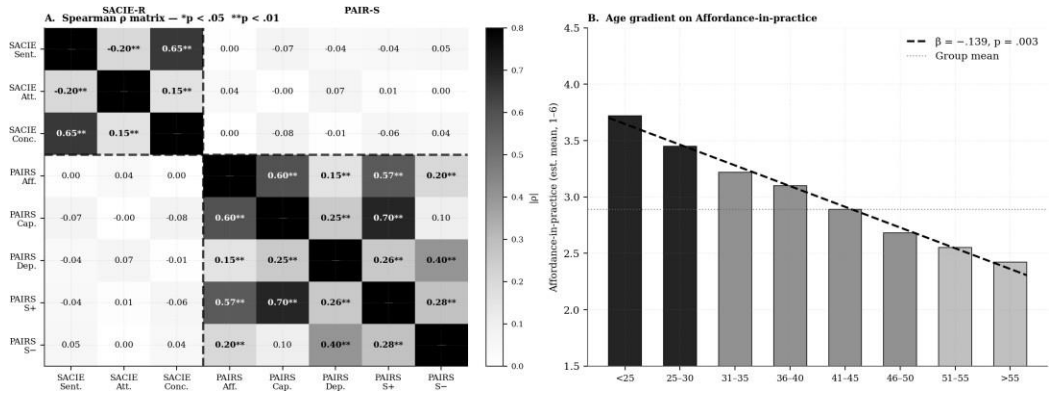


Figure 2. A: Spearman ρ matrix (N = 451); dashed line: SACIE-R / PAIR-S boundary; **p < .01. B: Age gradient on Affordance (β = −.139, p = .003).

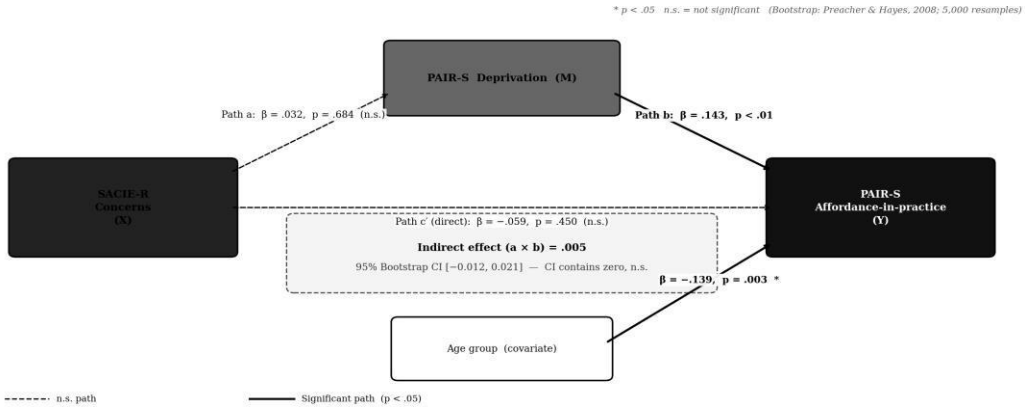


Figure 3. Bootstrap mediation H3 (N = 451; 5,000 resamples). Dashed: n.s. Solid: $p < .01$. CI [−0.012, 0.021] contains zero: H3 disconfirmed.

Discussion and Conclusions

Three findings converge on a precise pedagogical claim.

First: inclusive orientation and AI co-agency are structurally independent. Inclusive values are second-order beliefs that do not activate first-order technological behaviors (Ertmer, 2005; Tondeur et al., 2017). The bootstrap adds a nuance: Deprivation inhibits AI engagement when present, but its trigger is not inclusive anxiety , reframing the Frankenstein Complex empirically.

Second: the phenomenon is typological. For the Frankenstein Complex, emotional processing must precede AI literacy; for Inclusive Non-Adopters, an explicit bridge between care ethics and AI's possibilities is needed; for the Disengaged, professional identity formation comes first; only Reflective Adopters are ready.

Third: the most stable predictor is generational. Deprivation , cross-cluster, demographically invariant is the professional intelligence to cultivate: the discernment separating reflective co-agency from uncritical adoption.

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Orchestrating Hybrid Environments: A STIAEM Pilot Study on Teacher Identity and Algorithmic Ethics

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Generative AI (GenAI) integration within school ecosystems drives the co-configuration of hybrid learning spaces, forcing a radical methodological and docimological reconfiguration. This research aligns with the regulatory framework of the European AI Act, international frameworks from UNESCO and the OECD (2024), and the Italian Ministry Guidelines. To govern this evolution, the international Erasmus+ STIAEM project (Slow Tech Innovation: AI, Ethics, and New Teaching Methods - 2025-1-IT02-KA220-SCH-000365213) adopts the lens of Slow Tech (Patrignani & Whitehouse, 2014) and Human-in-the-Loop governance to preserve the teacher's design authorship and pedagogical intentionality against automation. Within this framework, AI Literacy is defined as an ecological-affective dimension surpassing technocentric views by integrating the Intelligent-TPACK framework (i-TPACK; Celik, 2023), the ABCE model for emotional and ethical evaluation (Ng et al., 2024), and the CARE-KNOW-DO framework (Okada et al., 2025) to prevent professional alienation from Agentic AI.

This quantitative pilot study maps teachers' perceptions and validates the psychometric soundness of a multidimensional CAWI questionnaire. The sample comprises 385 pre-service teachers (TFA) at the University of Foggia (80.8% female; 95.3% aged 25–54; 80.0% with under 5 years' experience), distributed across lower secondary (40.3%), upper secondary (36.9%), and kindergarten/primary (22.9%) schools. The instrument integrates demographic variables, the validated AI perceptions scale by Işık and colleagues (2024) measuring competence, anxiety, and usefulness, eight items mapped onto the European DigComp 3.0 framework, and three dilemmatic scenarios (Situational Judgment Tests) measuring pedagogical resistance to authorial deskilling (SD01), relational substitution (SD02), and GenAI-supported student assessment (SD03).

Latent Profile Analysis (LPA) identified three distinct teacher profiles: adaptive/tech-optimistic (63.1%; high competence/usefulness, low anxiety), ambivalent/anxious adopters (28.8%; high usefulness, high anxiety), and resistant/traditionalists (8.1%; low self-efficacy, high apprehension). One-way ANOVAs confirm that profile membership significantly influences responses to the dilemmas, showing highly significant variations for identity alienation ($F(2, 382) = 9.53$, $p < .001$), educational alliance defense ($F(2, 382) = 8.99$, $p < .001$), and assessment reconfiguration ($F(2, 382) = 5.13$, $p = .006$). Spearman's correlation reveals a positive association between design and relational scenarios ($\rho = 0.333$, $p < .001$), proving that safeguarding design autonomy is structurally linked to classroom interpersonal mediation. While profile distribution is independent of school level ($p = .390$), conditional ANOVA reveals that school grade directly impacts algorithmic anxiety ($F(2, 382) = 4.22$, $p = .015$), with Tukey's post-hoc test isolating higher vulnerability among lower secondary teachers compared to upper secondary colleagues (padj = .026).

This preliminary validation confirms the instrument's effectiveness for the upcoming large-scale survey across STIAEM partner countries (Italy, Spain, Greece, Turkey, and Lithuania). Internationally, scenario scales will adopt binary coding (0-1) to rigorously measure adherence to Slow Tech principles. Finally, the data offer crucial insights for establishing the physical STIAEM Hub, structuring advanced co-design zones alongside reflective counseling spaces to mitigate algorithmic anxiety and safeguard the human educational relationship.

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Topic 7

Kinesiology and sport between education and performance in European area

The educational value of competitive dancesport in adolescent athletes: perceived well-being, sports values and parental support

Aliberti Sara

Adolescence is a characterized by physical, psychological and social changes. Self-construction in dancers develops in parallel with physical maturation and the acquisition of increasingly specific motor and artistic skills (Ohashi et al., 2023). This process also includes the development of athletic identity, defined as the degree to which a person identifies with the role of an athlete (Edison et al., 2021). Competitive dancesport is an activity combining physical, expressive and relational aspects, contributing to the development of educational values and the improvement of psychological and physical well-being in adolescents. However, educational outcomes do not automatically result from sports participation alone but also depend on the quality of the environment and the influence exerted by significant adults, including coaches and parents. The educational significance of sports lies in the values that athletes attribute to their experience. According to Lee et al. (2008), sports values can be categorized into moral values, competence values, and status values. The development of these values is also influenced by the family context, given that parents can pass on their own values and passions to their children (Murray & Mulvaney, 2012), including the interest in sport. The competitive aspect can also expose young dancers to pressures related to performance, comparison with others, and public judgment. In competitive dancesport, some negative aspects have already emerged, such as issues related to body image, nutrition, and weight control or performance anxiety. The factors influencing participation, including values attributed to dance and parental involvement,have not yet been sufficiently investigated. The aim was to analyze the educational significance of competitive competitive dance among adolescent female athletes by examining sporting values, perceived parental involvement, and health-related quality of life. The sample consisted of 15 female athletes aged 11 to 20 (mean age, 13.33 ± 2.26 years) with an average experience of 4.00 ± 1.07 years, who had competed at the local and regional levels over the past two years. The athletes are members of a Latin American dance school in the Campania region. Participants were given a questionnaire divided into four sections: questions on demographic characteristics and their sporting activity, the Youth Sport Values Questionnaire-2 (YSVQ-2) to measure the athletes' dance sport values, the Parental Involvement in Sport Questionnaire (PISQ) to measure how they perceived their parental involvement and the KIDSCREEN-10 to assess perceived well-being. Spearman's correlation analysis was performed to identify correlations among the variables. A multiple linear regression analysis was conducted to investigate the independent contribution of perceived parental pressure and status values to health-related quality of life. The results showed that female athletes attribute greater importance to competence-related values, followed by moral values and status. Regarding perceived parental involvement, the highest score was for active involvement, followed by directive behavior and parental pressure. The athletes' level of well-being was average. Positive correlations emerged between age and years of experience ($r = .664$), competence-related values and parental support/understanding ($r = .545$), moral values and active involvement ($r = .524$), and status-related values and perceived parental pressure ($r = .575$). Furthermore, a positive relationship emerged between support/understanding and active involvement ($r = .733$) and between directive behavior and perceived pressure ($r = .643$). Well-being is positively associated with parental support/understanding ($r = .540$) and negatively associated with status values ($r = -.640$), directive behavior ($r = -.642$), and parental pressure ($r = -.748$). To answer the question, "Can an athlete want to win without parental pressure necessarily determining her competitive orientation?" a multiple linear regression analysis was conducted. The model was statistically significant; however, only perceived parental pressure showed a significant association with well-being, compared to status variables. The study highlighted the educational importance of competitive dance to promote the development of young girls, despite

the highly competitive nature of this discipline. Parents' attitudes are a factor that can influence the athletic experience in positive or negative ways. Parents and coaches should support the athlete's career through encouragement, listening, and understanding, focusing not only on competitive results, but also on the personal growth.

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Toward an Integrated Paradigm in Motor Learning and Kinesiology

Altavilla Gaetano

Human movement can no longer be interpreted exclusively through a mechanistic or biomechanical perspective but should be understood as a multidimensional phenomenon emerging from the interaction among sensory systems, cognitive processes, and conscious self-regulation. Contemporary developments in neuroscience, pedagogy, and kinesiology increasingly support an integrated interpretation of movement, in which perception, analysis, and awareness represent interconnected dimensions that influence learning, performance, prevention, and rehabilitation. The purpose of this contribution is to highlight the need for an integrated paradigm of motor learning and kinesiology capable of overcoming the traditional separation between physical and cognitive aspects of human action. Through a theoretical and argumentative approach based on a critical review of the scientific literature, the paper explores the reciprocal relationships among perception, movement analysis, and awareness within educational, sports, and rehabilitative contexts. Perception constitutes the first level of interaction between individuals and their environment. It enables the acquisition, organization, and interpretation of information derived from visual, proprioceptive, vestibular, and tactile systems, providing the basis for effective motor responses and adaptive feedback processes. Rather than being a passive mechanism, perception continuously selects and interprets stimuli relevant to action, allowing individuals to adapt motor behavior to changing environmental conditions. Educational experiences based on play, variability, and social interaction further demonstrate that perceptual development is closely linked to emotional and relational dimensions of motor learning. The second pillar of the proposed model is movement analysis. Analytical processes make it possible to identify functional and dysfunctional components of motor behavior, supporting the recognition of technical errors, compensatory strategies, and potential risk factors. In contemporary kinesiology, qualitative observation and technological tools such as video analysis and biomechanical monitoring systems contribute to more accurate and personalized interventions. Improvement cannot rely exclusively on repetition; rather, critical analysis enables informed decision-making, targeted corrections, and effective injury prevention strategies across educational and sporting environments. Awareness represents the highest level of the process by introducing a metacognitive dimension into motor learning. It involves the ability to recognize, monitor, and understand one's bodily states and actions, transforming learners into active participants in their own developmental pathways. Motor awareness enhances self-efficacy, motivation, intentionality, and self-regulation, facilitating the transfer of acquired competencies across different contexts. In educational, athletic, and rehabilitation settings, awareness promotes meaningful participation and supports sustainable behavioral change.

The integration of perception, analysis, and awareness provides a holistic framework for understanding movement as a phenomenon in which biological, cognitive, emotional, and social factors continuously interact. Educational methodologies based on heuristic learning, motor problem-solving, and variability of practice appear particularly effective in fostering adaptive and transferable competencies. Likewise, multidisciplinary approaches in preventive and rehabilitative programs contribute to greater effectiveness, adherence, and quality of life. From a professional perspective, the evolving role of the kinesiologist requires increasingly interdisciplinary competencies that combine motor sciences, pedagogy, psychology, and health promotion. Although recent regulatory developments have strengthened professional recognition, further clarification of competencies and operational domains remains necessary to support integrated and evidence-based practices. In conclusion, perception, analysis, and awareness should not be considered isolated constructs but complementary dimensions of a unified paradigm of motor learning and kinesiology. Understanding movement through this integrated perspective offers new opportunities for designing personalized

educational, sports, and rehabilitation interventions aimed not only at improving performance but also at promoting health, well-being, and comprehensive human development.

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Physical fitness and related factors in adolescents

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Regular physical activity in young people represents a key determinant of health, contributing to the improvement of physical fitness, cardiometabolic health, and the development of healthy behaviours that may be transferred to later stages of life (bull et al., 2020). However, in italy, participation levels remain insufficient, with a progressive decline in practice as age increases. Physical activity is closely associated with health-related physical fitness, which includes components such as cardiorespiratory fitness and muscular strength, both relevant for health and for the prevention of metabolic risk factors during developmental age (chuang et al., 2023).

However, motor practice also involves psychological, emotional, and social dimensions, including self-efficacy, motivation, and enjoyment, which are relevant for supporting adolescents' participation (berki et al., 2024). Within this framework, school and physical education represent privileged contexts for promoting active lifestyles through meaningful and methodologically oriented motor experiences.

This study assessed the relationship among motor tests, pa, and perceived enjoyment in a sample of italian adolescents.

Methods

The study involved 167 adolescents attending two upper secondary schools in the province of lecce, including 84 boys (15.42 ± 0.97 years) and 83 girls (15.52 ± 0.94 years). Physical activity levels and enjoyment were assessed using self-report questionnaires, whereas physical fitness was measured through a battery of eurofit motor tests. The analyses included descriptive statistics, pearson correlations, and exploratory multiple linear regression models, with the significance threshold set at $p < .05$.

Results

In the male sample, physical activity was associated with a broader physical fitness profile, showing significant correlations with strength, power, endurance, agility, and speed tests, as well as with enjoyment ($r = .36$, $p < .01$). In the female sample, the associations between physical activity and physical fitness were more selective, mainly involving the shuttle run ($r = -.25$, $p = .02$) and the 30 m test ($r = -.25$, $p = .02$), whereas physical activity was positively associated with enjoyment ($r = .37$, $p < .01$). The exploratory mediation analyses showed that, in both genders, physical activity predicts enjoyment; however, enjoyment does not mediate the relationship between physical activity and motor performance. Overall, enjoyment appears to represent a cognitive-emotional component associated with participation in physical activity, rather than an explanatory mechanism in the relationship between physical activity and physical fitness.

Discussion and conclusion

The results show a gender-specific pattern. In boys, physical activity was associated with a more favourable physical fitness (pf) profile, whereas in girls this relationship appeared more selective and mainly related to speed tests. These findings also recall the pediatric inactivity triad model, according to which reduced motor opportunities may limit strength, physical literacy, and active participation (faigenbaum et al., 2018). In both genders, physical activity was positively associated with enjoyment, confirming its role as a cognitive-emotional component of motor participation (berki et al., 2024). However, enjoyment did not emerge as a mediator between physical activity and performance, appearing mainly as a dimension associated with participation.

Overall, the findings suggest the need to design school-based interventions oriented not only toward the quantity of movement, but also toward the quality of motor experiences. From this perspective,

the teacher assumes a central role in pedagogical mediation, promoting students' motor, cognitive, affective, and social engagement (colella, 2016).
The study confirms significant relationships among physical activity, physical fitness, and enjoyment in adolescents. Enjoyment emerges as a cognitive-emotional component of motor participation, although it does not mediate the relationship between physical activity and performance. The findings highlight the role of school physical education in promoting active lifestyles through meaningful, inclusive, and motivating experiences, emphasizing the teacher's pedagogical mediation and the flexible use of teaching styles.

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Bodily self, exercise and ai in pediatric immune diseases: therapy or education as well?

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Bodily self-consciousness (BSC) is based on the brain's integration of multisensory signals, visual, somatosensory and vestibular. Postural control represents the main interface between the body and BSC, regulating the dynamic body schema. Recent evidence demonstrates a bidirectional link between postural stability and emotional states, highlighting how anxiety negatively affects proprioception. At the same time, a sedentary lifestyle and chronic psychological stress stimulate neuroendocrine pathways in children that increase inflammatory markers, reduce mucosal immune defences.

Traditional postural programmes are limited to two-dimensional feedback or mirrors, however, Artificial Intelligence applied to education (AIED) now enables 3D biological modelling and interactive multisensory feedback. This study evaluates the effectiveness of an innovative AI-guided postural programme in a multisensory environment (IPT-ME) compared with traditional postural treatment (TPT), analysing the combined impact on postural parameters, psycho-affective well-being and immunological profile.

The study used a 12-week randomised controlled design. Thirty paediatric participants (aged 8–12 years) diagnosed with mild-to-moderate immune disorders and a sedentary lifestyle were recruited and divided equally into two treatment groups (two 45-minute sessions per week): TPT (n=15): Standard balance and proprioception exercises based on verbal feedback from the specialist and the use of mirrors; IPT-ME (n=15): Protocol based on the Moti Physio PAViR AI system. The programme involved a motor learning cycle divided into three phases (video observation of an expert, execution and self-assessment via video replay), supplemented by unstable surfaces and natural auditory feedback to stimulate sensory reweighting.

Pre- and post-intervention assessments, performed in a controlled environment, included 3D postural analysis using the PAViR depth camera, the administration of psychological questionnaires (CBCL and STAIC), and salivary measurements of immunoglobulin A (sIgA) and inflammatory cytokines (IL-1β, IL-6).

All 30 participants completed the intervention without any adverse events. At baseline, there were no significant differences between the groups.

The two-way ANOVA analysis revealed significant Time × Group interactions for all variables: Postural Profile: Both groups showed significant improvements in all parameters assessed (head inclination AHT, forward shoulder posture RS, thoracic kyphosis TK, lumbar lordosis LL, pelvic tilt AP-PT and HKA axes). However, the TPT group recorded only outcomes with a small effect size, whilst the IPT-ME group showed moderate to large changes, with a marked regression in segmental deviations. Psychological Profile: Only the IPT-ME group showed a statistically and clinically significant decrease in state and trait anxiety scores (STAIC) and in behavioural problems reported by parents (CBCL), indicating a large effect size. No changes were observed in the TPT group. Immunological Profile: The IPT-ME group showed a significant increase in sIgA levels and a simultaneous 26% reduction in the pro-inflammatory cytokines IL-1β and IL-6 (with a high effect size). No significant immunological changes were recorded in the TPT group.

The results confirmed that the integration of 3D biofeedback and multisensory stimuli increased the effectiveness of corrective therapy. The postural success of IPT-ME lies in the video self-correction loop, which accelerates proprioceptive recalibration and the restructuring of the body schema.

On a psychological level, active observation and immersion in relaxing soundscapes reduced motor monitoring anxiety. From a psychoneuroimmunological perspective, the significant reduction in

stress and adaptive motor stimulation have suppressed the systemic inflammatory response and reactivated barrier immune defences (sIgA), restoring homeostatic balance. The study's limitations include the small sample size, the follow-up period limited to 12 weeks, and the lack of blood biomarkers for comparison.
In conclusion, the adoption of rehabilitation ecosystems based on Artificial Intelligence proves to be a holistic strategy superior to traditional methods, capable of simultaneously generating biomechanical, psychological and immunological benefits in paediatric patients.

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The Algorithmic Body in Contemporary Kinesiology: Biomechanical Feedback and Artificial Intelligence in Motor Learning

Cusano Pompilio

The integration of artificial intelligence into physical education and kinesiology is transforming the ways in which movement is observed, interpreted, and learned. Contemporary technological systems, including wearable devices, inertial sensors, and adaptive algorithms, are no longer limited to collecting biomechanical data but actively participate in the regulation and construction of motor experiences. This evolution requires a reconsideration of traditional conceptions of the body and motor learning, moving beyond mechanistic interpretations toward more integrated perspectives that acknowledge the interdependence of cognitive, affective, and technological dimensions. The purpose of this contribution is to explore the concept of the algorithmic body as an emerging paradigm in contemporary kinesiology and to discuss its implications for motor learning, educational practice, and human development. Through a theoretical and argumentative approach grounded in kinesiology, complexity theory, and embodied learning, the paper examines how artificial intelligence mediates the relationship between perception, movement, and awareness within adaptive learning environments. Traditional approaches to motor learning have generally conceived the body as a biomechanical system that can be optimized through the control of measurable variables such as force production, movement efficiency, precision, and technical execution. Although these perspectives have contributed significantly to the development of movement sciences, they have often reduced bodily experience to quantifiable parameters, neglecting the perceptual, emotional, and relational dimensions that characterize human action. Recent developments in ecological dynamics and complexity theory have challenged these assumptions by emphasizing that movement emerges through the continuous interaction among individuals, tasks, and environments. Within this framework, learning is understood as an adaptive and situated process rather than a linear progression toward predefined technical models. Artificial intelligence introduces an additional level of complexity to this scenario. Adaptive feedback systems based on wearable technologies provide real-time information that influences motor behavior, supports self-regulation, and facilitates personalized learning pathways. Rather than functioning as passive instruments, these technologies become active mediators within educational and sporting contexts, shaping the ways in which learners perceive their own bodies and interpret movement-related experiences. The feedback generated by intelligent systems does not merely correct errors but contributes to the construction of meaning, motivation, and bodily awareness. Consequently, motor learning can no longer be interpreted as an exclusively human or exclusively technological process, but rather as the outcome of dynamic interactions among biological, social, and digital components. This perspective leads to the concept of the algorithmic body, understood as a hybrid system in which human agency and technological mediation coexist within a shared learning environment. The algorithmic body does not imply the replacement of embodied experience by artificial intelligence; instead, it highlights the emergence of new forms of interaction through which movement, perception, and self-awareness are continuously negotiated. In this context, technologies function as educational mediators capable of amplifying reflective processes and supporting adaptive responses, provided that their use remains grounded in pedagogical principles and human-centered values.

The integration of artificial intelligence into kinesiology therefore requires interdisciplinary competencies that combine movement sciences, pedagogy, neuroscience, and digital literacy. Educational practices should avoid purely technocentric approaches and instead promote critical engagement with intelligent systems, enabling learners to develop both technical skills and bodily awareness. The challenge for contemporary physical education is not to decide whether artificial intelligence should be incorporated into learning environments, but rather to understand how

technological innovation can support meaningful, embodied, and sustainable educational experiences. From this perspective, the algorithmic body represents not a departure from human movement traditions but an opportunity to rethink motor learning as a complex, adaptive, and relational phenomenon capable of integrating technological progress with the fundamental dimensions of human development.

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Digital Affective Literacy in Physical Education: A Comprehensive Review and an Exploratory Survey on Teachers' Perceptions of AI and Digital Technologies

D'Elia Francesca

Physical Education (PE) represents an emotionally rich learning environment where students experience continuous interactions, feedback loops, and embodied activities that strongly shape motivation, self-efficacy, and social participation. In recent years, this context has been increasingly influenced by digital technologies and emerging artificial intelligence (AI) systems. International evidence indicates that the combination of digital tools and social-emotional learning (SEL) pathways can significantly enhance students' outcomes in PE, supporting motivation, engagement, and inclusive participation (Saqinah et al., 2025). At the same time, a recent scoping review of 63 studies highlights that SEL development in PE remains theoretically fragmented and only partially aligned with the main pedagogical models adopted in the field (Dyson et al., 2021). This gap suggests the need for frameworks capable of integrating emotional, relational, and technological dimensions in a coherent and ethically grounded manner.

Building on these insights, this contribution presents an exploratory survey conducted with Italian PE teachers aimed at investigating perceptions, attitudes, and current practices related to digital technologies and AI in school-based PE. The results show generally positive attitudes toward technology. However, teachers report a limited use of AI tools, which are perceived as less accessible and more complex compared to traditional digital devices.

Several barriers emerge, including insufficient training, limited availability of equipment, concerns about data privacy, and fears that AI-mediated interactions may reduce the authenticity of teacher–student relationships. These concerns reflect a broader tension between technological innovation and the relational core of PE, where emotional attunement, empathy, and embodied communication play a central role.

Teachers' perceptions of the impact of digital tools on motivation and inclusion appear heterogeneous. Some educators describe positive effects, while others express doubts about the risk of distraction, reduced autonomy, or unequal access to devices. The findings suggest that digital technologies, and AI in particular, can support affective and social learning processes only when embedded within pedagogically informed frameworks that preserve the centrality of human interaction.

Drawing together evidence from the literature and insights from the survey, the study proposes a conceptual framework for Digital Affective Literacy in PE, emphasizing three key dimensions:

1. Emotional awareness and regulation, supported by reflective digital tools and multimodal feedback;
2. Relational authenticity, ensuring that AI complements rather than replaces embodied teacher–student interactions;
3. Ethical and responsible integration.

The framework highlights the irreplaceable relational role of educators and advocates for an AI integration that is sensitive to the emotional nature of PE, ethically grounded, and aligned with model-based practices. Future research should explore how generative AI can support reflective practice, personalized learning, and teacher professional development without compromising the affective and embodied foundations of PE.

In addition, the growing diffusion of AI-enhanced applications, such as motion-tracking systems, adaptive training platforms, and multimodal feedback tools, invites a deeper reflection on how digital innovation can be aligned with the affective and relational specificities of PE (Tohănean et al., 2025). Preliminary evidence suggests that AI may support differentiated instruction, facilitate formative assessment, and help students develop greater emotional awareness through personalized feedback loops. Yet these opportunities require careful pedagogical mediation to avoid forms of over-automation that could weaken students' agency or reduce the spontaneity of embodied

interactions. Teachers in the survey emphasize that any technological integration must remain subordinate to the relational climate of PE, where trust, empathy, and shared emotional regulation constitute essential conditions for meaningful learning. This perspective reinforces the need for professional development pathways that equip educators with both technical competences and affective literacy skills, enabling them to critically evaluate AI tools, adapt them to diverse classroom contexts, and maintain a balanced interplay between human guidance and technological augmentation. Within this horizon, AI becomes not a substitute for pedagogical intentionality but a potential catalyst for reflective practice, inclusive participation, and emotionally attuned learning experiences.

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Embodied volleyball-based learning for mathematical-spatial reasoning in primary school

Del Sorbo Francesco

The regulatory framework of Italian primary school pivots on D.M. 254/2012, supplemented by Nuovi Scenari (2018), and radically overhauled by D.M. 221/2025, effective from 2026/2027. Law 234/2021 introduced the specialist motor teacher in fourth and fifth grades, offering an unprecedented opportunity to bridge motor and cognitive development within shared curricular time. A persistent gap, however, separates regulatory ambitions from daily classroom practice: conventional mathematics instruction generates performance anxiety and conceptual obstacles through premature symbolic formalization (Zan, 2007; D'Amore & Fandiño Pinilla, 2005), producing mechanically memorized abstract formulas rather than coherent geometric mental models.

Embodied Cognition theory (Wilson, 2002; De Freitas & Sinclair, 2014) posits that higher-order cognition is grounded in sensory-motor body-environment interactions. In Italian pedagogy, this finds methodological expression in Giocosport and open-skill disciplines (Casolo, 2011; Gomez Paloma, 2013). Volleyball constitutes an elective embodied laboratory: its geometrically polarized field, divided by the net, requires continuous topological mapping, trajectory anticipation, and distance estimation (Hraste et al., 2018; Trecroci et al., 2021), reducing mathematics anxiety (Otero & Lafuente Fernández, 2022). Contextual Teaching and Learning (Johnson, 2002) further specifies that the motor setting does not perform a mere motivational function but restructures the cognitive architecture of learning through goal-oriented physical action. Validated experimental protocols integrating structured sport games with STEM outcomes remain scarce in Italian scientific literature. RQ1: Does a volleyball-based embodied intervention improve mathematical-spatial reasoning in fifth-grade pupils relative to conventional instruction, controlling for pre-test differences? RQ2: Do engagement levels differ significantly between groups? H1 predicts superior post-test scores in the Experimental Group (EG) after ANCOVA adjustment; H2 predicts higher EG engagement across three dimensions: attention, participation, and enthusiasm.

Method

A quantitative quasi-experimental pre-test/post-test design with non-equivalent intact classes was adopted, coherent with the organizational and ethical constraints of the Italian school context. Forty-eight fifth-grade pupils from two parallel classes of a primary school in the province of Naples (academic year 2025/2026) were assigned to EG (n=24) or Control Group (CG, n=24). The CG received conventional frontal instruction; the EG participated in eight 70-minute sessions over four weeks, each structured as: embodied motor action in the gym (30 min), facilitated conceptual decoding discussion (20 min), and abstract-reflective consolidation via worksheets (20 min). Five mathematical-spatial dimensions, distance measurement, estimation and comparison, intuitive angles, spatial relationships, and problem solving, were mapped onto volleyball motor patterns. The same curricular teachers delivered mathematics in both conditions; the specialist motor teacher co-conducted gymnasium phases in the EG.

Instruments included a mathematical-spatial reasoning test and an engagement observation scale, both validated by an expert panel (Cronbach's $\alpha > 0.76$). Fidelity was monitored via observation checklist (adherence = 92%; inter-rater Cohen's $\kappa = 0.84$). Primary analysis: ANCOVA with post-test score as dependent variable, group as independent variable, and pre-test as covariate (effect size: partial η^2p). Engagement differences were assessed via independent-samples t-tests ($\alpha = .05$).

Results

Groups were statistically equivalent at baseline ($t(46) = -0.33$, $p = .74$). ANCOVA assumptions were confirmed: Levene's test ($p > .05$); homogeneity of regression slopes ($F(1,44) = 1.12$, $p = .295$). The ANCOVA revealed a significant and large treatment effect ($p < .001$, $\eta^2p = .391$), with the

intervention accounting for approximately 39.1% of post-test variance. Normalized gain (N-Gain) was markedly superior in the EG. T-tests showed significant engagement differences favoring the EG: Active Participation (+0.72), Attention (+0.64), and Enthusiasm (+0.61).

Discussion and Limitations

The large effect size corroborates Embodied Cognition theory: learning benefits intrinsically from sensory-motor grounding rather than abstract decontextualization. The volleyball court constituted a natural Cartesian reference system, enabling pupils to construct geometric and topological meanings through bodily action before symbolic codification — deconstructing the conceptual obstacles described by D'Amore and Fandiño Pinilla (2005) and the performance anxiety documented by Zan (2007). Engagement gains confirm cooperative motor action as a catalyst for attentional and motivational processing (Lindgren & Johnson-Glenberg, 2013; Macedonia, 2019), substantiating a sustainable low-tech alternative to costly immersive technologies. Methodological limitations include: restricted sample (N=48, single province); absence of random assignment; no longitudinal follow-up; possible novelty effect; short intervention window (four weeks).

Conclusion

Integrating volleyball into fifth-grade mathematics instruction produced significant gains in mathematical-spatial reasoning and student engagement. Findings validate the principles underlying Nuovi Scenari (2018) and D.M. 221/2025, confirming the specialist motor teacher as a strategic co-designer of interdisciplinary STEM pathways. Initial and in-service teacher training programs should systematically incorporate Embodied Education and Contextual Teaching and Learning methodologies, transforming the body into a powerful cognitive instrument for an inclusive and deeply situated mathematics education.

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Effects of hiit, liss, and pha on body composition: the role of standardized measurements and subjective perceptions in health promotion

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Exercise prescription has progressively evolved toward individualized approaches that consider not only physiological adaptations but also psychological responses and long-term adherence (1). Among the most frequently adopted training models in health-oriented fitness and personal training are High-Intensity Interval Training (HIIT), Low-Intensity Steady-State (LISS), and Peripheral Heart Action (PHA) training. These methodologies differ substantially in exercise intensity, workload distribution, metabolic demand, and neuromuscular involvement, potentially inducing different adaptive responses (2). Although previous studies have demonstrated positive effects for each modality, comparative evidence simultaneously examining body composition and psychophysical outcomes using standardized anthropometric procedures remains limited (3). Identifying modality-specific adaptations may assist exercise professionals in selecting the most appropriate intervention according to individual objectives and participant characteristics.

The aim of this study was to compare the anthropometric and psychophysical adaptations induced by HIIT, LISS, and PHA through an integrated analysis of three pilot studies conducted under comparable real-world supervised personal training conditions.

An integrated comparative analysis was performed on three quasi-experimental interventions involving 36 physically active adults (18 men and 18 women) allocated to HIIT (n = 12), PHA (n = 12), or LISS (n = 12). Pairwise comparisons (HIIT vs LISS, HIIT vs PHA, and LISS vs PHA) were derived from the same overall sample and therefore represent complementary analyses rather than independent experiments.

Each intervention lasted 12 weeks and consisted of three supervised training sessions per week. Exercise intensity was continuously monitored using Polar H9 heart-rate monitors to ensure adherence to the prescribed training zones. HIIT was performed at 80–95% of maximal heart rate, PHA at 70–80%, and LISS at 60–70%.

Anthropometric assessment followed International Society for the Advancement of Kinanthropometry (ISAK) standards and included body mass, body mass index, circumferences, skinfold thicknesses, adipose mass estimated using Kerr's model, muscle mass estimated using the Lee equation, and somatotype according to the Heath-Carter method. At the end of the intervention, participants completed a structured questionnaire exploring perceived psychological well-being, physical well-being, and perceived improvements in physical performance. Descriptive statistics were expressed as mean ± standard deviation. Depending on data distribution, within-group comparisons were performed using paired-samples t-tests or Wilcoxon signed-rank tests, whereas between-group differences were analysed using independent-samples t-tests, Welch's t-tests, or Mann–Whitney U tests, as appropriate. Differences in questionnaire responses were evaluated using Pearson's chi-square or Fisher's exact test. Statistical significance was set at $p < 0.05$.

All exercise modalities produced significant improvements in body composition after the 12-week intervention. Body mass decreased by 4.0% following HIIT, 4.45% following LISS, and 1.52% following PHA. Similar reductions were observed for BMI (−4.5%, −4.28%, and −1.72%). Adipose mass significantly decreased in all groups, confirming the effectiveness of structured exercise regardless of training modality.

However, important differences emerged in the adaptive profiles. HIIT showed the greatest tendency to preserve muscle mass (+0.47 kg), whereas slight reductions were observed following both PHA and LISS. Likewise, HIIT produced the largest reduction in endomorphy, suggesting greater effectiveness for body recomposition. PHA elicited balanced cardiovascular and neuromuscular

adaptations without reaching the magnitude of changes observed following HIIT. LISS produced anthropometric improvements comparable to HIIT for body mass reduction despite the substantially lower exercise intensity.
Subjective responses also differed among training modalities. Participants performing HIIT reported the highest perceived improvements in overall physical performance, strength, speed, and endurance. Conversely, individuals assigned to the LISS protocol reported significantly greater psychological well-being and more favorable perceptions of exercise tolerability, suggesting a higher potential for long-term adherence. PHA generally produced intermediate scores across both anthropometric and psychophysical outcomes.
The present integrated analysis demonstrates that HIIT, LISS, and PHA are all effective strategies for improving body composition in physically active adults, although each exhibits a distinct adaptive profile. HIIT appears particularly suitable for maximizing metabolic adaptations and preserving muscle mass, whereas LISS promotes greater psychological well-being and exercise adherence. PHA represents a balanced alternative combining cardiovascular and neuromuscular benefits. These findings support an individualized approach to exercise prescription based on both anthropometric goals and psychophysical responses, highlighting the value of standardized ISAK anthropometry for accurately assessing body composition changes.

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Relationship Between Take-Off Velocity and Neuromuscular Parameters During the Countermovement Jump

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The Countermovement Jump (CMJ) is the most widely used tests for assessing lower-limb neuromuscular performance in sport. Owing to its simplicity, reliability, and sensitivity to training adaptations, it is commonly used to monitor athletes' physical condition. Although jump height is traditionally considered the primary outcome of CMJ performance, it is mechanically determined by take-off velocity. Therefore, identifying the neuromuscular factors associated with greater take-off velocity may provide valuable information for both performance assessment and training prescription.

Previous research has shown that CMJ performance depends on several mechanical and neuromuscular factors, including maximal power, force production, countermovement strategy, and stretch-shortening cycle (SSC) efficiency. Mcerlain-Naylor et al. Demonstrated that kinetic and kinematic variables contribute differently to jump performance, whereas Pérez-Castilla et al. Highlighted the influence of countermovement depth and movement velocity on jump mechanics. Moreover, the meta-analysis by Berton et al. Reported that resistance and plyometric training improve CMJ performance primarily through enhanced lower-limb power production. Despite these findings, little is known about which neuromuscular variables explain the variability between repeated maximal jumps performed by the same athlete within a single testing session.

Most previous studies have compared different athletes or investigated training interventions over time. Conversely, comparing the best and worst jump performed by the same individual minimizes inter-individual variability and allows a more direct evaluation of the neuromuscular characteristics associated with optimal performance.

Therefore, the aim of this study was to compare the neuromuscular characteristics of the best and worst Countermovement Jump performed by each athlete, identified according to the highest and lowest take-off velocity, in order to determine which variables are most closely associated with superior jump performance.

Thirteen male amateur soccer players voluntarily participated in the study. All participants were free from musculoskeletal injuries and had previous experience performing maximal cmjs. Following a standardized warm-up, each athlete completed multiple maximal jumps on a force platform. For every participant, the jump with the highest take-off velocity was classified as the BEST trial, whereas the jump with the lowest take-off velocity was classified as the WORST trial.

The following variables were extracted from force-platform analysis: Maximum Power (Max Power), Peak Rate of Force Development (Peak RFD), Time to Take-Off (TTT), and modified Reactive Strength Index (mrsi).

Paired-samples t-tests were used to compare BEST and WORST conditions, with statistical significance set at $p < 0.05$. Cohen's d was calculated to quantify effect size.

Significant differences were observed for Max Power and mrsi. Maximum Power was significantly greater during the BEST jumps ($p < 0.01$; $d > 1.0$), indicating substantially greater mechanical power production when athletes achieved higher take-off velocities. Likewise, mrsi was significantly higher in the BEST condition ($p < 0.01$; $d \approx 1.0$), suggesting greater neuromuscular efficiency during superior performances.

Conversely, no significant differences were found for Peak RFD or Time to Take-Off ($p > 0.05$). Although both variables are commonly considered indicators of explosive performance, the present findings suggest that they are not the primary determinants of the variability observed between repeated maximal jumps performed by the same athlete.

Overall, the results indicate that higher take-off velocity is mainly associated with greater power production and more efficient use of the SSC rather than with faster initial force development or shorter movement duration. Since jump height is directly determined by take-off velocity, the ability to generate high levels of power throughout the concentric phase appears to be a key determinant of CMJ performance.
From a practical perspective, these findings support the implementation of training strategies aimed at maximizing lower-limb power production and SSC efficiency. Ballistic resistance exercises, Olympic weightlifting derivatives, and plyometric training may therefore represent effective methods for improving take-off velocity and vertical jump performance.
In conclusion, comparing the best and worst CMJ attempts within the same athlete provides valuable insight into the neuromuscular determinants of jumping performance while minimizing the influence of inter-individual variability. Greater take-off velocity appears to be primarily associated with higher maximal power output and improved mrsi, whereas Peak RFD and Time to Take-Off seem to play a less decisive role. These findings contribute to a better understanding of the mechanisms underlying CMJ performance and may assist practitioners in designing more targeted monitoring and training strategies.

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The ABMOVE! Active Breaks Program: Effects on School and Mathematics Anxiety in a Multisite Cluster RCT

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Physical inactivity among school-age children is a recognised public-health concern. The school is a key setting, since children spend much of the day seated, with movement largely confined to recess and physical education (World Health Organization, 2020). Prolonged sitting has been associated with less favourable health profiles (Carson et al., 2016) and with poorer on-task attention and classroom engagement (Mahar et al., 2006).

Classroom-based physical activity has emerged as a feasible, low-cost and scalable strategy (Daly-Smith et al., 2018; Norris et al., 2020). Active breaks, brief and structured bouts of movement led by the class teacher that interrupt academic work, reliably raise children's in-class physical activity and can support classroom behaviour, executive functioning and academic engagement (Masini et al., 2020).

School anxiety in the primary years

Far less is known about whether active breaks also shape children's emotional functioning, and academic anxiety in particular. This is a meaningful gap, because academic anxiety is measurable already in the early primary years and shows a small but reliable, reciprocal association with achievement (Barroso et al., 2021; Caviola et al., 2022).

Two constructs are especially relevant here. School anxiety refers to the cognitive, behavioural and physiological reactions children display in situations appraised as evaluatively threatening. It is multidimensional and classically distinguishes a cognitive component, worry, from an emotional and physiological component, emotionality (Liebert & Morris, 1967), the worry component being especially detrimental to performance (von der Embse et al., 2018). It is reported more often among girls than among boys (Robson et al., 2023).

Mathematics anxiety refers to the tension and apprehension that arise when children engage with numerical content. It is consistently linked to poorer mathematics performance (Barroso et al., 2021; Caviola et al., 2022), an effect often attributed to anxious thoughts consuming working-memory resources (Ashcraft & Kirk, 2001; Ramirez et al., 2013). It is also associated with lower self-efficacy, reduced enjoyment and greater avoidance of mathematical activities (Dowker et al., 2016).

The present study

The present study investigates ABMOVE!, a teacher-delivered programme that embeds brief active breaks into primary mathematics lessons. Each break pairs a short bout of movement with a mathematical objective and closes with a guided-breathing phase that returns the class to a calm state. Its rationale draws on two converging lines of evidence: that interrupting prolonged sitting with short bouts of activity supports children's attention and engagement (Mahar et al., 2006), and that physical activity is associated with reduced physiological arousal and better emotional functioning (Biddle et al., 2019; Donnelly & Lambourne, 2011). Because the breaks are delivered within mathematics, a subject in which anxiety is common, the study examines whether a movement-based classroom routine influences children's academic anxiety.

Two research questions guide the study: whether participation in ABMOVE! reduces children's mathematics anxiety, and whether it reduces their school anxiety, overall and in its worry and emotionality components, relative to a control condition.

Method

ABMOVE! was evaluated through a multi-site cluster randomised controlled trial, with randomisation at the class level. Intact classes were assigned to the ABMOVE! programme or to a control condition of standard instruction without active breaks, and outcomes were measured before and after the intervention. The study involved 37 Italian primary schools across three regions (Sicily, Puglia and Piedmont), for a total of 244 classes and 4221 pupils in grades 2 to 5 (ages 7 to 11).

Schools in the experimental condition implemented the programme for twelve weeks, with three active breaks per week of about 10 to 12 minutes, integrated into mathematics lessons. Each break followed a tripartite structure: an opening routine, a core motor task linked to a mathematical objective, and a closing cool-down with guided breathing. Teachers received training, remote monitoring and a kit of paper and digital materials.

Two validated self-report instruments were administered at both time points. Mathematics anxiety was assessed with the Abbreviated Math Anxiety Scale (AMAS), validated for Italian primary school children by Caviola et al. (2017). School performance anxiety, with its worry and emotionality components, was assessed with the Worry Emotionality-Junior Scale (WE-J; Di Vita & Di Martino, 2024), validated for Italian pupils in grades 3 to 5.

The nested data structure, pupils within classes within schools, was analysed through three-level linear mixed models estimated via restricted maximum likelihood, with treatment as a class-level predictor and baseline score, grade, region and gender as covariates, and random intercepts at the class and school levels.

Preliminary findings

Preliminary analyses confirmed that the two groups were well balanced at baseline and that a non-negligible share of variance lay at the class and school levels. The trial's central finding is that active breaks integrated into mathematics lessons were associated with a measurable effect on children's academic anxiety, but that this effect proved selective rather than uniform, since the two forms of anxiety examined did not respond in the same way.

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Visual Search Behavior and Visual Occlusion in Open-Skill Sports: Ecological Dynamics Implications for Performance and Motor Learning

Esposito Giovanni

In open-skill sports, performance depends on an athlete's ability to adapt to dynamic environments by identifying relevant information and transforming it into effective actions. Team sports, racket sports, and combat sports require anticipation, rapid decision-making, and continuous motor adaptation. Therefore, expertise cannot be interpreted merely as technical execution, but rather as the outcome of the interaction between the athlete, the task, and the environment. The ecological dynamics approach has highlighted the role of perception-action coupling and task constraints in motor learning. However, understanding perceptual-cognitive performance in complex sports requires integration with models of anticipation and decision-making to clarify how athletes identify and exploit information that is functionally relevant to action. Despite growing interest in visual information processing in sport, visual search, anticipation, and visual occlusion are often investigated using separate paradigms that do not always reflect real-world performance. Consequently, it remains unclear how the availability and selection of visual information guide both action and training. The aim of this narrative review is to examine the role of visual search behavior and visual occlusion in open-skill sports, clarifying how these phenomena contribute to the understanding of anticipation, decision-making, and action from an ecological dynamics perspective. The narrative review was conducted using a structured search procedure inspired by PRISMA guidelines. Experimental studies, reviews, and theoretical contributions addressing visual search behavior, visual occlusion, anticipation, decision-making, and perceptual-cognitive expertise in open-skill sports were considered. The search identified 412 records; after duplicate removal and screening based on methodological quality and thematic relevance, 36 studies were included. The selected studies showed considerable heterogeneity in terms of sport disciplines, athletes' expertise levels, stimulus characteristics, assessment tools, and outcome measures. Nevertheless, several consistent findings emerged. The first concerns visual search behavior. Expert athletes do not simply scan more extensively; rather, they selectively attend to information that is most relevant to task demands. Their visual strategies are therefore efficient, flexible, and sport-specific, focusing on postural, spatial, kinematic, or relational cues. The second concerns the contribution of visual occlusion to understanding perceptual-decisional processes. The evidence indicates that performance depends on the availability of information distributed across time and space. Successful anticipation requires not merely the recognition of isolated cues, but also the integration of multiple sources of information in relation to available opportunities for action. Visual occlusion therefore provides an effective means of identifying which informational variables are functionally relevant for movement prediction and regulation. The third concerns practical applications. Visual occlusion may represent a valuable tool for designing perceptual training interventions; however, its effectiveness depends on preserving the functional relationship between visual information and motor responses. Improvements observed in video-based or highly controlled laboratory tasks do not necessarily transfer to real competitive settings, which are characterized by variability, time pressure, and opponent interaction. From an ecological dynamics perspective, visual occlusion should not be viewed simply as the removal of visual stimuli, but rather as a manipulation of task constraints capable of guiding learning within representative practice environments.

The main limitations identified include methodological heterogeneity, the predominance of decontextualized experimental protocols, and the limited availability of longitudinal studies conducted in ecologically valid settings. Future research should integrate visual behavior, decision-making, and motor execution within representative performance environments that better reflect competitive demands.

In conclusion, visual search behavior and visual occlusion represent complementary approaches to understanding how athletes perceive, interpret, and use information in open-skill sports. The available evidence suggests that effective performance depends on the ability to identify task-relevant information and rapidly transform it into functional actions. Future research and practice should focus not on training visual behavior in isolation, but on designing learning environments in which perception, decision-making, and action are fully integrated to promote adaptations that effectively transfer to competitive performance.

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University Sport Facilities as a Tool for Student Well-being and Social Integration

Falese Lavinia

European universities are increasingly expected to promote not only academic achievement but also students' health, well-being and social inclusion. Campus recreation activities and sport are consistently associated with better physical and mental health, resilience, social connectedness and academic success (Sim et al., 2026; Soria et al., 2022; Forrester, 2015). However, research has mainly focused on participation in recreational programmes, whereas much less attention has been devoted to students' experiences of university sport facilities and the organisational characteristics that may influence well-being and integration. This gap is particularly relevant in increasingly international universities, where sport facilities represent one of the few campus environments in which students meet voluntarily outside formal teaching, creating opportunities for interaction, friendship and belonging (Miller, 2011; Eubank & DeVita, 2023; Leșco et al., 2025).

Drawing on the Biopsychosocial Model (Engel, 1977) and Self-Determination Theory (Ryan & Deci, 2000), this study considers university sport facilities as educational environments that may simultaneously support physical activity, psychological well-being and social connectedness.

Building on this conceptual framework, the aim of the present study is to investigate how participation in university sport and students' satisfaction with sport facilities are associated with mental well-being and social integration.

Methods

A cross-sectional survey was conducted among 122 students enrolled at Jagiellonian University (Poland), including 76 international and 46 Polish students. The questionnaire collected demographic information, frequency of sport participation, satisfaction with university sport facilities, perceived social integration and mental well-being assessed through the validated Short Warwick–Edinburgh Mental Well-being Scale (SWEMWBS) (Stewart-Brown et al., 2009). Facility satisfaction included six dimensions: accessibility, equipment, cleanliness, booking procedures, staff support and safety. Associations among variables were examined using Pearson correlation coefficients, followed by exploratory multiple linear regression analyses to identify the facility characteristics independently associated with well-being and social integration.

Results

Satisfaction with university sport facilities was positively associated with mental well-being ($r = .28$, $p = .002$). Participation in university sport was positively associated with social integration ($r = .30$, $p < .001$), which, in turn, was positively related to mental well-being ($r = .30$, $p < .001$). No significant differences emerged between local and international students in overall facility satisfaction, social integration or well-being.

Exploratory analyses showed that students' evaluations were driven primarily by organisational characteristics. Staff support, booking procedures, cleanliness and perceived safety showed the strongest associations with overall facility satisfaction. Exploratory item-level analyses identified staff support and perceived safety as the facility characteristics most strongly associated with students' well-being and social integration ($R^2 = .19$, $p < .001$) and social integration ($R^2 = .23$, $p < .001$).

Discussion

The findings reinforce previous evidence that university sport contributes to students' well-being while extending the focus from participation itself to the quality of the sport environment (Sim et al., 2026). The positive association between sport participation and social integration is consistent with studies showing that recreational sport facilitates sociocultural adaptation and strengthens

students' sense of belonging, particularly among international students (Rosenthal et al., 2007; Önal & Biricik, 2025; Leșco et al., 2025).

A notable finding is that organisational characteristics of sport facilities appeared more relevant than physical infrastructure. Supportive staff, perceived safety and efficient management were more strongly associated with well-being and social integration than location or equipment. This suggests that the value of university sport facilities depends not only on providing places to exercise but also on creating welcoming environments that encourage participation, repeated social interaction and a sense of belonging. These findings are consistent with Self-Determination Theory, which highlights the importance of supportive environments in satisfying the need for relatedness (Ryan & Deci, 2000), and with the Biopsychosocial Model, which emphasises the interaction between biological, psychological and social determinants of health (Engel, 1977).

Conclusions

University sport facilities should be viewed not simply as recreational amenities but as educational and social infrastructures that can contribute to healthy and inclusive universities. Their impact appears to depend not only on opportunities for physical activity but also on the quality of the organisational environment, particularly supportive staff, safe spaces and effective management. Universities aiming to promote student well-being should therefore invest not only in facilities but also in inclusive services and programmes that promote participation, social interaction and belonging. The on-going extension of the study to an Italian university will allow future comparisons across different European higher education contexts.

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When the digital self becomes embodied: neurosensory interaction between body and AI

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Twenty-first-century digital technologies and prolonged screen time are significantly altering human behavior, replacing physical presence with virtual interactions and leading to a degradation of the "bodily self". This increasingly sedentary lifestyle is directly linked to widespread incorrect posture and musculoskeletal pain among young adults, rendering them highly vulnerable to degenerative spinal conditions later in life. Crucially, these postural changes are not merely mechanical but involve complex neurophysiological implications, as the skeletal muscle system plays a central role in co-regulating both motor and psycho-emotional states. Operating as a dynamically adaptive property, muscle tone is highly sensitive to postural demands and altered postural muscle activity directly shifts emotional arousal and stress regulation. These findings highlight the importance of embodied cognition, a theoretical framework asserting that human cognition and self-regulation are fundamentally grounded in physical, sensorimotor interactions with the environment. Consequently, the physical restriction imposed by digital immersion severely erodes these sensorimotor foundations, drastically reducing an individual's multisensory awareness of proprioceptive and interoceptive signals. To address this gap and investigate whether Artificial Intelligence integrated with multisensory biofeedback could restore the active dimension of the bodily self, researchers conducted a comprehensive 12-week randomized controlled trial. The study involved 90 healthy young adults with an average age of 22.6 years, who were equally divided into three distinct intervention groups to evaluate the acquisition of an embodied cognition of the tonic postural system. The first group, Traditional Postural Treatment (TPT), relied on standard postural treatment methodologies, utilizing traditional mirrors and verbal corrections while performing targeted exercises to correct specific muscular imbalances. The second group, Interactive Postural Treatment (IPT), integrated AI-driven, real-time visual feedback, requiring participants to watch videos of expert models and engage in a critical self-feedback loop by viewing their own recordings to adjust their mechanics. The third group, Interactive Postural Treatment in a Multisensory Environment (IPT-ME), performed the same AI-driven interactive tasks as the IPT group but within an augmented, immersive mountainous setting designed to challenge the nervous system's integration capabilities. This enriched environment manipulated sensory constraints through the simulation of a mountainous environment. Throughout the twice-weekly 60-minute sessions, postural alignment was accurately assessed without invasive tools using the Posture Analyzing and Virtual Reconstruction (PAViR) system, an AI-powered depth camera that evaluated metrics such as Difference in Shoulder Height, Round Shoulders, Thoracic Kyphosis, Lumbar Lordosis, Anterior-Posterior Pelvic Tilt, and Pelvic Obliquity. Following the 12-week intervention, statistical analyses utilizing repeated-measures two-way ANOVAs revealed that all three treatment modalities promoted statistically significant improvements from pre- to post-intervention across every measured postural variable, confirming that targeted strengthening and stretching exercises effectively resolve muscular imbalances. However, when comparing the changes among the groups to determine the most effective treatment, a one-way ANOVA demonstrated that there were no statistically significant differences in outcomes between the traditional TPT approach and the AI-driven visual feedback of the IPT group. Conversely, the IPT-ME protocol produced vastly superior improvements across all structural variables, yielding moderate to large effect sizes when compared to both the IPT and TPT groups. By manipulating environmental constraints with complex auditory, haptic, and olfactory feedback, the immersive multisensory environment successfully forced the central nervous system to profoundly recalibrate balance strategies across diverse sensory domains. Ultimately, these findings strongly support the theoretical framework of embodied

cognition, proving that enriched multisensory environments optimally facilitate the integration of proprioceptive and interoceptive signals, enabling young adults to deeply internalize optimal postural execution and effectively counteract the physical detriments of modern digital dependency.

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School-Based Coordinative Motor Intervention and Gross Motor Skill Development in Primary School Children: The Mediating Role of Physical Activity Enjoyment

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School-based physical activity interventions have consistently demonstrated positive effects on children's motor competence, physical fitness, and health. However, the psychological mechanisms underlying these improvements remain insufficiently understood.

Primary school age represents a critical developmental period for the acquisition and refinement of gross motor skills, making it important to identify motivational and affective factors that may support motor learning.

Gross motor skills include locomotor abilities (e.g., running, jumping, hopping) and object-control skills (e.g., throwing, catching, kicking), which are fundamental for participation in physical activity and sport. Among school-based approaches, coordinative motor training has gained increasing attention because it simultaneously promotes motor, cognitive, and psychosocial development. Coordinative activities are characterized by variability, problem-solving, progressive challenges, and immediate feedback, creating learning environments that may foster positive emotional experiences. In this context, physical activity enjoyment represents a particularly relevant psychological factor. Children who enjoy physical activity are more likely to participate actively, persist in challenging tasks, and maintain engagement over time, thereby creating favorable conditions for motor skill development. According to developmental models of physical activity and motor competence, positive movement experiences may strengthen participation and provide additional opportunities for motor learning.

The present study aimed to examine whether physical activity enjoyment mediates the relationship between participation in a school-based coordinative motor intervention and gross motor skill development. Additionally, the study investigated whether gender moderates the association between enjoyment and motor competence.

An experimental pretest–posttest control-group design was employed. Participants were 184 primary school children from Southern Italy (mean age = 9.49 ± 0.52 years), including 94 girls and 90 boys. Children were assigned by class to either an experimental group (n = 110) or a control group (n = 74). The experimental group participated in a 16-week coordinative motor training program implemented during physical education lessons, with two 60-minute sessions per week. Activities focused on the development of balance, rhythm, spatial-temporal orientation, motor control, and hand–eye and foot–eye coordination through movement games, obstacle courses, jumping activities, throwing and catching exercises, and rhythmic tasks. The control group continued with the regular physical education curriculum.

Gross motor competence was assessed using the Test of Gross Motor Development–Third Edition (TGMD-3), while physical activity enjoyment was measured through the Italian version of the Physical Activity Enjoyment Scale (PACES). Mediation and moderated mediation analyses were conducted using Hayes' PROCESS Macro (Model 14), controlling for baseline TGMD-3 and PACES scores.

The intervention significantly increased physical activity enjoyment compared with the control condition ($B = 12.86$, $p < .001$). In turn, post-test enjoyment significantly predicted post-test gross motor competence ($B = 0.43$, $p = .005$).
A significant direct effect of the intervention on gross motor skills remained after accounting for enjoyment and covariates ($B = 8.72$, $p < .001$), confirming the effectiveness of the coordinative training program. Moreover, the indirect effect through enjoyment was significant, indicating a partial mediation effect.
Bootstrapped analyses revealed significant indirect effects for both boys (ab = 4.68, 95% CI [2.30, 8.15]) and girls (ab = 3.88, 95% CI [1.28, 7.30]). However, the interaction between enjoyment and gender was not significant ($B = -0.06$, $p = .403$), and the index of moderated mediation included zero, indicating that the mediation effect did not differ significantly across gender.
The findings confirm that school-based coordinative motor training is an effective strategy for enhancing gross motor competence in primary school children. The intervention's combination of varied, progressively challenging, and game-based activities appeared to promote both motor learning and positive affective experiences.
A key finding of this study is that physical activity enjoyment represents an important psychological mechanism underlying the effectiveness of the intervention. Children who experienced greater enjoyment achieved better motor outcomes, supporting theoretical models that link motivation, participation, and motor competence. Enjoyment likely promotes greater engagement, effort, and persistence during movement activities, contributing to motor skill development. However, the persistence of a significant direct intervention effect indicates that motor improvements also result from motor-learning and neuromuscular adaptation processes, suggesting that enjoyment is one of several factors influencing motor competence.
Gender did not moderate the relationship between enjoyment and motor competence, indicating that the intervention was equally effective for boys and girls.
Overall, the findings suggest that school-based coordinative interventions improve motor competence both directly and indirectly through increased enjoyment. These results highlight the value of integrating enjoyable, coordinative activities into physical education to simultaneously support motor development and positive engagement in physical activity during childhood.

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Yoga as an Integration to the Preparation of Mixed Martial Arts Athletes: Postural Control, Breathing Pattern, and Flow

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Mixed Martial Arts (MMA) require a high level of integration between postural control, respiratory function, and attention, which are fundamental elements for performance efficiency (1). In recent years, yoga has been progressively incorporated into athletic training because of its potential effects on stability, respiratory control, and body awareness (2). Furthermore, these adaptations may promote the flow state, a condition of complete involvement during performance (3). However, in combat sports, the evidence regarding the effectiveness of yoga and the relationship between functional adaptations and psychological aspects remains limited.

The primary objective of this study is to evaluate whether the integration of a yoga protocol into the training of MMA athletes can improve postural control and functional breathing patterns, which are considered essential factors for the efficiency of sport-specific performance. Additionally, the study aims to determine whether these adaptations are accompanied by an improvement in the experience of the mental flow state during training.

The study was conducted using a controlled pre–post parallel-group design. A total of 60 Mixed Martial Arts (MMA) athletes (18–35 years old), with at least 12 months of continuous training experience, were recruited. Participants were allocated to an experimental group (n = 30), which integrated its usual training with an 8-week yoga protocol (2 sessions/week, 60 minutes per session), and a control group (n = 30), which continued its usual training program. Assessments were performed at baseline (T0) and at the end of the intervention (T1). Postural control was assessed using the Y-Balance Test, respiratory function was evaluated using the Breath-Hold Test and the Hi-Lo Breathing Assessment, and the flow experience was measured using the Flow State Scale-2 (FSS-2). Statistical analysis included descriptive statistics, assessment of normality using the Shapiro–Wilk test, evaluation of the internal consistency of the FSS-2 using Cronbach's alpha, and a two-way repeated-measures analysis of variance (2 × 2 ANOVA) to examine the effects of time, group, and their interaction.

The two-way repeated-measures ANOVA revealed a significant time × group interaction for all variables analyzed ($p < 0.05$). In the experimental group, the Y-Balance Test score increased from 91.8 ± 4.7% to 97.3 ± 4.2%, whereas the control group showed only a minimal improvement (92.1 ± 4.5% vs. 93.0 ± 4.6%). The Breath-Hold Test also showed a significant improvement in the group that underwent the yoga protocol, with the mean breath-holding time increasing from 37.6 ± 8.4 to 47.8 ± 8.1 seconds, compared with the modest change observed in the control group. At the same time, the Hi-Lo Breathing Assessment showed an increased prevalence of the diaphragmatic breathing pattern in the experimental group (from 33.3% to 76.7%), whereas no significant changes were observed in the control group. Regarding the psychological aspects, the total Flow State Scale-2 score increased in the experimental group (3.82 ± 0.44 vs. 4.29 ± 0.39), with particularly marked improvements in the dimensions related to concentration on the task and sense of control over action. Furthermore, improvements in postural control and breath-holding time were moderately correlated with the increase in flow scores ($r = 0.46$ and $r = 0.42$, respectively; $p < 0.01$).

The results suggest that integrating a yoga protocol into the training of Mixed Martial Arts (MMA) athletes may improve postural control, the efficiency of functional breathing patterns, and the experience of flow (4). The improvement in postural control and respiratory function suggests that yoga may promote greater movement efficiency and better management of physical effort during performance. At the same time, the increase in Flow State Scale-2 scores and the correlations observed with the functional adaptations support a close relationship between the physical and

psychological components of performance (5). Overall, these findings support the use of yoga as a complementary strategy to the traditional training of MMA athletes.
The integration of yoga into the training of MMA athletes may represent a useful complementary strategy for improving some of the functional prerequisites of performance, particularly postural control and the efficiency of functional breathing patterns. The potential improvement in the experience of the mental flow state further suggests that such interventions may also contribute to supporting the psychological dimension of performance in combat sports.

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How Artificial Intelligence Supports Physical Activity: An Exploratory Functional Taxonomy

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Physical inactivity and sedentary behaviour represent one of the most pressing global health challenges of the twenty-first century. Insufficient physical activity is causally associated with non-communicable diseases, mental health disorders, and premature mortality (Bull et al., 2020; WHO, 2022). Artificial intelligence (AI) has emerged as a promising avenue for promoting physical activity at scale: AI-powered tools can deliver personalised coaching, adaptive training plans, real-time feedback, and behavioural nudges in ways that traditional interventions cannot replicate (Guerriero et al., 2026). However, the landscape of AI tools for physical activity is highly heterogeneous and research remains fragmented, with no comprehensive functional mapping of tools available to end users. This chapter addresses that gap.

This contribution draws on an exploratory mapping study in which AI tools for physical activity promotion were identified through systematic navigation of There's an AI for That a directory indexing over 50,000 AI tools. Of 53 tools initially identified, 33 were retained after applying inclusion and exclusion criteria (exclusions: B2B-only platforms, hardware-dependent devices, sport-specific tools, unverifiable items). Each tool was analysed using an inductive qualitative functional classification (Braun & Clarke, 2006), with categories emerging from comparative analysis rather than predefined frameworks.

Six functional categories emerged:

Adaptive Real-Time Coaching.

Tools in this category provide immediate guidance during or immediately after the session, targeting execution quality, intensity, and technique. Examples include Arvo (set-by-set resistance training coaching), Broccoli AI (adaptive audio running coaching), and Forma Run (asynchronous video-based biomechanical feedback).

Adaptive Workout Planning.

The most populated category: tools that generate and continuously update personalised training programmes based on user history, recovery, goals, and equipment. Mechanisms include progressive overload optimisation (Fitbod, FitnessAI), body composition analysis from photographs (Zing Coach, FlexToast), and multi-sport periodisation via LLM pipelines (Pelaris).

Monitoring and Tracking.

Tools that record and interpret physiological and activity data to inform — without prescribing — training decisions: HRV-based readiness scoring (Welltory), automatic exercise detection via smartwatch (Train Fitness), and unified health data aggregation (Gyroscope).

Promotion of Daily Movement.

Distinct from structured exercise tools, this category addresses sedentary behaviour in everyday contexts. NeckFit provides AI-based postural analysis for desk workers; AI Steps promotes walking through personalised nudging; Posture Reminder AI uses on-device computer vision to detect postural deviation during computer use. The locus of action is the daily environment rather than the gym.

Motivation and Engagement.

Two distinct mechanisms emerged: narrative gamification (Zombies, Run! — physical movement advances a post-apocalyptic audio story) and social competition (Strava — community tracking, leaderboards, virtual segments). Both promote physical activity without prescribing its content,

operating through engagement architectures consistent with Self-Determination Theory (Ryan & Deci, 2017).

Conversational Coaching and Behaviour Change.

Tools using conversational AI agents on messaging platforms (Delta Driven, Telegram) or LLM interfaces (FitGPT, Running Habit Architect via ChatGPT) to deliver coaching through natural language dialogue. Embedding AI coaching within existing messaging platforms reduces adoption barriers (Laranjo et al., 2018; Montelaghi et al., 2025).

Discussion and Conclusions

The taxonomy reveals that AI mediates physical activity across a spectrum of contexts — from the gym floor to the workstation, from social networks to narrative worlds. The predominance of adaptive workout planning reflects a technological emphasis on personalisation, though the convergence of many tools on a single functional profile raises questions about genuine differentiation. The promotion of daily movement category is particularly significant from a public health perspective: it targets non-exercisers and intervenes in the everyday environments where sedentary behaviour actually occurs (Ueno et al., 2022). Future research should assess effectiveness within each category, examine equity implications, and integrate AI tools with behaviour change frameworks such as SDT and COM-B.

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The spectrum of teaching styles in school physical education: a scoping review of experimental studies.

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School physical education contributes not only to students' motor development but also to their cognitive, motivational, and social growth. Within this perspective, the selection of appropriate teaching methodologies plays a key role in enhancing the quality of learning (Solmon, 2015; Casey & Goodyear, 2015). Among the most influential pedagogical frameworks is the Spectrum of Teaching Styles developed by Mosston and Ashworth (2008), which conceptualizes teaching as a continuum ranging from teacher-centered (reproductive styles) to student-centered approaches (productive styles), based on the progressive transfer of decision-making from teacher to learner.

The international literature recognizes the Spectrum as an effective framework for promoting autonomy, problem-solving, motivation, and active student engagement (Byra, 2006; Goldberger et al., 2012). Nevertheless, recent research has mainly focused on theoretical, methodological, and teacher education issues, whereas experimental studies conducted in school settings remain limited (Syrmpas et al., 2016; Monacis et al., 2024).

Therefore, the aim of this scoping review was to identify and synthesize experimental studies published between January 1, 2016, and May 5, 2026, that explicitly implemented Mosston and Ashworth's teaching styles in school physical education with students aged 6–18 years.

A literature search was conducted in Google Scholar, PubMed, and SPORTDiscus using the following search string: ("teaching style*") AND ("spectrum of teaching style*") AND ("physical education"). Eligible studies were peer-reviewed articles conducted in school settings involving participants aged 6–18 years that explicitly implemented teaching styles included in Mosston and Ashworth's Spectrum. Theoretical or methodological studies, research involving teachers, coaches, or university students, theses, non-peer-reviewed publications, and studies lacking sufficient methodological information were excluded.

The search identified 55 records (2 from PubMed, 20 from SPORTDiscus, and 33 from Google Scholar). After duplicate removal and screening, 50 studies were assessed for eligibility, and 47 were excluded. Only three studies met all the inclusion criteria.

The included studies indicate that implementing the Spectrum of Teaching Styles may positively influence several dimensions of learning in physical education, including motor skills, physical fitness, motivation, self-perception, enjoyment, and student participation. In particular, the Reciprocal Style was found to facilitate the acquisition of sport-specific skills, whereas combining reproductive and productive teaching styles appeared to enhance student engagement, autonomy, and active participation. Overall, the findings suggest that the flexible use of different teaching styles represents an effective instructional strategy for addressing students' diverse educational needs while promoting more inclusive learning environments.

This review highlights that, despite the widespread theoretical recognition of the Spectrum of Teaching Styles, the number of experimental studies conducted in school settings remains extremely limited. Most recent publications focus on theoretical, methodological, or teacher education issues rather than evaluating the effects of different teaching styles on students' learning outcomes. These findings are consistent with those reported by Syrmpas et al. (2016) and Monacis et al. (2024), who identified the Spectrum as a well-established pedagogical framework that has only rarely been translated into systematic experimental practice in schools.

Although only a small number of studies met the inclusion criteria, the available evidence consistently suggests that integrating reproductive and productive teaching styles may enhance not only motor

learning but also motivational, cognitive, and social outcomes. These findings reinforce the potential of the Spectrum as a flexible pedagogical framework capable of adapting instruction to students' characteristics and educational objectives.
The main limitations of this review include the small number of eligible studies, the methodological heterogeneity of the interventions, and the variability of the outcomes assessed, all of which limit direct comparison across studies.
This scoping review confirms that, despite the well-established pedagogical relevance of the Spectrum of Teaching Styles, experimental evidence from school physical education remains scarce. The available studies report promising effects on motor competence, motivation, self-perception, and student participation; however, the current evidence is insufficient to draw definitive conclusions.
Future research should develop larger, longitudinal, and methodologically rigorous experimental studies to investigate the effectiveness of different teaching styles across school levels and with respect to specific motor, cognitive, motivational, and socio-emotional outcomes. Such evidence would further strengthen the role of the Spectrum as a reference framework for inclusive, student-centered, and high-quality physical education.

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Empowering Women in Boxing: Overcoming Challenges and Inspiring the Next Generation

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Youth tend to be inspired by role models around them, such as family, friends, teachers, etc. Media can affect adolescents' thoughts and behaviors, athletes and other public figures can also play an influential role in shaping adolescents' perceptions. However, athletes' social responsibility is still debated, since some consider athletes as role models and others as performers.
As literature reveals, women tend to choose both male and female athletes as role models. While men tend to prioritize role models' traits more related to athletic achievement and dominance, women also focus on qualities like sportsmanship, kindness, and self-confidence, emphasizing the necessity of diverse role models.
The predominance of male role models in sports underlines the importance of providing positive female role models to counter gender stereotypes. Successful women in sports can be inspiring role models for young female athletes, especially in their adolescent years. Gender-congruent role models may offer aspirational support, as women succeeding in male-dominated disciplines provide motivation and challenge stereotypes.
Over the years, women have also experienced exclusion and marginlisation in amateur and elite boxing, to ultimately achieve equal participation with their inclusion in the Olympic Games in 2012. They also recognise that practicing this sport, once socially considered less acceptable, could enhance women's psychological well-being, self-esteem and self-efficacy.
This study aims to provide a comprehensive understanding of Italian female boxers' motivations, the initial factors that lead them to practice boxing, the public perception of this sport and strategies used to overcome gender stereotypes, to identify survey items for a follow-up study.
Materials and Methods
This study uses a descriptive mixed-methods approach including dyadic interviews with a panel of experts to identify key areas and the development of survey items.
The dyadic interviews explored the following core dimensions: a) Initiation into Boxing: Motivations, Early Influences, Support, and Barriers; b) Inspirational Figures and Sporting Role Models; and c) Public Perception, Media Representation, Existing Barriers to Boxing; and d) Gender Stereotypes in Boxing: Strategies and Interventions for Driving Change.
The experts' panel included eight elite (or former) female boxers (age: 29-48 yrs), one of whom also coaches adaptive boxing. All participants have national and international experience and volunteered to participate in this study. Interviews were conducted on Zoom™; video files were reviewed several times and time-stamped transcripts were compared against the recordings.
Results and Discussion
All interviewees began boxing at various ages, driven by self-determination, with the support of at least one parent. Within the social networks, including relatives and teachers, they received a mix of encouragement and critics, confirming how women often face disapproval in a male-dominated sport. Interviewees also agreed that role models can reinforce societal norms and gender hierarchies, warning against unrealistic comparisons with idealized figures, which can set unattainable expectations. Successful same-gender role models show that success in male-dominated fields is achievable. However, women boxers have fewer boxing-specific role models, and may look to successful male boxers, or even outside the sport, for inspiration.

The grow of female boxers is breaking gender conventions; however, boxing is still perceived as male-dominated sport and issues related with traditional gender roles and stereotypes remain prevalent at every level, including coaching. Interviewees also unanimously agreed that in Italy women's boxing is not covered enough in the media, unlike in the UK where it is more supported and receives more media attention.

Interviewees' personal experience is coherent with literature showing as media often underrepresents female boxers through biased framing of their stories and performances, necessitating an improved media literacy. It often perpetuates a subtle form of sexism that remains even as more obvious prejudice disappears. The enduring masculine perception of boxing, along with the limited media attention it receives, continues to create obstacles for women's full inclusion and their full recognition in this sport.

Regarding the items to be included in the follow-up study, interviewees agreed, among others, on the following ones:

Initiation into Boxing: Birthplace: Indicate the number of inhabitants of; It was the same where you started your practice? It was your decision to start boxing; If not who helped you? Did you receive support from your network? Who was most helpful? Was anyone dissuading you?
Public Perception and Media Representation: Role models: Did you have anyone? Was he/she from Sport or other fields? If a Sportsperson: it was from boxing or other disciplines? If a boxer, it was a male or female one? If not a boxer: why? Can you name 5 champion female boxers you know? Why did you choose these names?
Inspirational Figures and Sporting Role Models: Do you think boxing is still seen as a male sport? If not, what contributed to this change? Do you think boxing is still under-covered by media? Is it women's boxing less than men's one?
Gender Stereotypes in Boxing: Do you think there's still work to be done to break down barriers and gender stereotypes related to boxing? How are you personally contributing? List any barriers that can be named.

Conclusions

This study offers an in-depth view of the multiple factors that can influence female participation in boxing in Italy. By breaking down social barriers, increasing media exposure and fostering supportive environments can contribute to a more inclusive and empowering space for women in boxing. Continuing to challenge norms and preconceptions will open the door to a brighter and fairer future for female boxers in Italy.

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To Win or to Educate? AI and the Ethical Tension between Performance and Process

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Artificial intelligence, predictive analytics and biometric monitoring are turning physical education into a data-driven environment. Although these tools may personalise training and improve efficiency, they can also shift attention from the lived body to the measurable body, from individual progress to standardised performance, and from pedagogical judgement to algorithmic authority. Digital Affective Literacy is therefore understood as the educator's ability to interpret algorithmic outputs critically, preserve the relational and affective dimensions of movement, and use digital tools as temporary supports rather than substitutes for embodied care (Pangrazio & Selwyn, 2019; Tronto, 1993).

The study explored how future sports professionals negotiate conflicts between performance optimisation and educational responsibility. Achievement Goal Theory and Self-Determination Theory were used to consider whether AI-supported practices foster performance-oriented control or protect autonomy, competence and relatedness (Deci & Ryan, 2000). Critical work on datafication informed the analysis by highlighting the risk that metrics may govern educational purposes rather than serve them (Biesta, 2009).

Methodology

Participants

The sample comprised 38 professionals in training: 24 Master's students in Science and Management of Sport and Physical Activity and 14 trainee teachers enrolled in the A-48 qualification programme. The groups represented different stages of professional identity and experience in school settings.

Ethical Dilemma Workshop

Data were collected in a 90-minute focus-group workshop organised into four phases: contextual introduction, collaborative analysis, dialogic feedback and conceptual debriefing. Participants discussed four narrative dilemmas concerning biometric assessment, an emotional-support chatbot, biomechanical standardisation and predictive analytics. Each dilemma contrasted AI efficiency with autonomy, inclusion, relational care or the right to trial and error. Workshop worksheets and feedback transcripts were examined through thematic analysis.

Results and Discussion

Master's students

The Master's students adopted a protective and humanistic stance. They described AI as reductive, standardising and potentially alienating, while presenting teacher empathy as irreplaceable. Algorithmic data were accepted only as advisory information and rejected whenever they conflicted with human judgement, individual progress or inclusion. This position showed strong sensitivity to depersonalisation, but offered fewer strategies for managing technological integration.

3.2 A-48 trainee teachers

The trainee teachers adopted a pragmatic and mediated stance. They accepted AI as a technical resource, but denied it autonomous evaluative authority. The teacher was positioned as an epistemological mediator who interprets data in relation to the student's history, circumstances and educational goals. Participants proposed a Teacher–Student–Robot Triad organised through scaffolding, mediation and fading: technology first supports participation, then becomes an object of shared interpretation, and is finally withdrawn as autonomy and relational confidence increase.

Comparative interpretation

The main difference concerned the authority granted to algorithmic outputs. Group 1 protected the educational relationship through a clear separation between human and machine. Group 2 preserved human responsibility through controlled integration. Their responses expressed a more articulated form of Digital Affective Literacy because they combined technical usefulness, critical interpretation and relational responsibility. Inclusion therefore depends not on the technology itself, but on the pedagogical framework within which it is used.

Conclusion

The Ethical Dilemma Workshop appears to be a promising educational and heuristic tool for teacher training. It can expose assumptions about data, empathy and professional responsibility while avoiding both technophobic rejection and uncritical automation. Teacher education should move beyond technical digital literacy and include applied AI ethics, critical data interpretation, embodied pedagogy and human oversight. Algorithmic outputs should never become automatic marks or unmediated judgements; they should function as temporary reflective supports. The teacher remains the essential hermeneutic filter between data, the learner and the educational context.

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Wearable technologies to promote student well-being and experiential learning: insights from the proben II project

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Wearables and mobile sensing can unobtrusively capture psychophysiological signals related to arousal, stress, and self-regulation, potentially enabling "affective education" approaches where emotional/physiological states inform learning support and well-being promotion. Recent works in educational settings promise to combine wearable biometrics with AI for detecting stress/attention and informing personalization, while also emphasizing major barriers such as limited standardization and ethical concerns (privacy, governance, etc.) [1,2]. In this context, the PRO-BEN II is a funding programme of the Italian Ministry of University and Research aimed at promoting psychophysical well-being among university students and workers, preventing psychological and emotional distress. It includes both research activities and interventions for prevention, support, information, and awareness. In particular, the PRO-BEN II sub-study "Mind & Move" integrates mindfulness-based training, digital physical activity monitoring, and campus-based physical activity resources to support university community well-being. We present the PROBEN II "wearable+app+environment" ecosystem and report preliminary findings from a psychophysiological sub-study on mindfulness. Electrocardiogram plus sternal 3D-accelerometry was collected across a mindfulness course (7 weeks) at three timepoints (start, mid, end), with recordings in seated rest, orthostatism, and during mindfulness sessions. Heart rate variability (HRV) metrics (time domain; RMSSD) and cardio-respiratory indicators (respiratory frequency) were derived, and individual response to mindfulness profiles were classified (responder/non-responder). The broader PROBEN II deployment includes an app-based activity monitoring pathway for students and staff and campus outdoor fitness enhancements to foster engagement in experiential, health-promoting routines. Fourteen participants contributed 84 longitudinal ECG/HRV records and 28 orthostatic tests. At the group level, the vagal tone index RMSSD (Root Mean Square of Successive Differences between normal-to-normal heartbeat) during mindfulness was higher than during seated rest both pre- and post-training: PRE mindfulness 36.8 ± 24.0 [m ± SD] ms vs PRE rest 30.5 ± 21.7 ms; POST mindfulness 34.3 ± 29.1 ms vs POST rest 25.4 ± 13.0 ms. Respiration frequency was lower during mindfulness than seated rest: PRE mindfulness 0.253 ± 0.056 Hz vs PRE rest 0.289 ± 0.064 Hz; POST mindfulness 0.250 ± 0.064 Hz vs POST rest 0.296 ± 0.053 Hz. The orthostatic 30:15 ratio of the RR interval series increased from 1.126 ± 0.141 to 1.182 ± 0.112 (Δ +0.056). However, the individual profiling revealed marked heterogeneity (4 strong responders, 4 moderate responders, 2 mild/mild-moderate, 3 adverse, 1 uninterpretable) between subjects. These state-level patterns align with wearable-based mindfulness evidence showing acute HRV increases during sessions (e.g., 10-day app-based RCT: in-session HRV increase, p=0.029) and ecologic mHealth data demonstrating acute RMSSD increases during meditation sessions (+4.68 ms) [4]. These preliminary data support the feasibility of integrating wearable-derived autonomic markers into university well-being interventions, while also underscoring a key issue for "algorithmic heartbeats" in educational contexts: high inter-individual variability limits the interpretability of group means and motivates person-centered, longitudinal

analytics. This aligns with recent reviews indicating that wearable+AI approaches can classify learning-relevant states but still lack standardized acquisition/reporting [1]. The PROBEN II ecosystem positions wearable feedback not only as a monitoring tool but as a scaffold for experiential learning, supporting self-awareness, habit formation, and reflective practices, provided that privacy-preserving design and transparent consent remain central. Therefore, the PROBEN "Mind & Move" experience suggests that wearable technologies can be operationalized within a multi-component university program to support well-being and experiential learning. However, the early HRV results indicate heterogeneous autonomic responses to mindfulness, highlighting the need for individualized trajectories and ethically grounded, context-aware analytics when translating biometric data into educational interventions.

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The contribution of microteaching to physical education teacher training: methodological implications

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Initial physical education teacher education has become a strategic priority for improving the quality of school education and responding to the pedagogical transformations associated with contemporary educational systems. Within this context, Physical Literacy (PL) has emerged as a comprehensive pedagogical framework that promotes the integrated development of motor competence, cognitive processes, motivation, and social-emotional skills throughout the lifespan (Whitehead, 2010; Martins et al., 2021). Consequently, teacher education should extend beyond the transmission of disciplinary knowledge and provide future teachers with methodological competencies that enable them to design inclusive learning environments, analyse motor tasks, and select appropriate teaching strategies.

Microteaching (MT) represents one of the most effective methodologies for developing teaching competence because it integrates lesson planning, teaching practice, systematic observation, structured feedback, and reflective practice within a controlled learning environment. In physical education, however, limited attention has been devoted to the relationship between MT, motor task analysis, and the purposeful use of the Spectrum of Teaching Styles (Mosston & Ashworth, 2008).

The purpose of this study was to present a methodological framework for integrating MT into initial physical education teacher education through Physical Literacy and the systematic application of the Spectrum of Teaching Styles.

The proposed methodology was implemented within the initial physical education teacher education programme at the University of Salento (Italy). Thirty-two pre-service teachers participated in structured peer microteaching activities under the supervision of university instructors.

Students alternated between the roles of teacher and learner in groups of six to eight participants. Each microteaching episode included lesson planning, teaching, peer observation, structured feedback, lesson redesign, and reteaching. The instructional focus was centred on motor task design, organisational strategies, and the purposeful selection and variation of the Teaching Styles proposed by Mosston and Ashworth.

Teacher behaviour was analysed using predefined descriptors corresponding to each Teaching Style. Observation focused on the relationship between instructional objectives and motor tasks, task adaptation to students' individual characteristics, variation of Teaching Styles, use of equipment and learning environments, communication strategies, and safety management. Feedback was provided through structured observation checklists and collective discussion.

The implementation of peer microteaching enabled pre-service teachers to systematically analyse the relationship between instructional decisions and students' learning processes. The observation of teaching behaviours facilitated a deeper understanding of how motor task design and Teaching Style selection influence teacher–student interactions, students' engagement, and learning opportunities.

The analysis confirmed that the combined use of reproduction and production Teaching Styles offers complementary educational functions. Reproduction styles proved particularly effective for introducing motor skills, developing physical fitness, and providing structured practice. Conversely, production styles promoted active participation, creativity, problem solving, movement variability, and adaptation of motor tasks according to students' individual needs, consistently with the principles of Physical Literacy.

Structured peer feedback further enhanced participants' reflective abilities, supporting the progressive refinement of instructional planning and teaching performance.

The findings support the integration of microteaching into initial physical education teacher education as a pedagogically effective strategy for bridging theoretical knowledge and teaching practice. Unlike traditional university instruction, MT provides authentic opportunities for pre-service teachers to analyse their instructional decisions, receive systematic feedback, and progressively improve their teaching competence.

Integrating MT with the Spectrum of Teaching Styles extends its educational value beyond the development of generic teaching skills by encouraging future teachers to critically reflect on the educational effects of motor tasks, the interaction between reproduction and production Teaching Styles, and the relationship between instructional decisions and students' learning processes. This approach is fully consistent with contemporary perspectives on Physical Literacy and quality physical education, which emphasise learner-centred pedagogy, inclusion, and meaningful participation.

Microteaching represents an effective methodological approach for preparing reflective and competent physical education teachers. The integration of Physical Literacy, motor task analysis, and the Spectrum of Teaching Styles enables pre-service teachers to develop evidence-informed pedagogical competencies while strengthening their capacity to design inclusive, flexible, and meaningful learning experiences.

The proposed framework contributes to improving initial teacher education by promoting systematic reflection on teaching behaviour, informed decision-making, and the purposeful selection and variation of Teaching Styles. Future research should investigate the long-term impact of this approach on teaching effectiveness and students' learning outcomes in school physical education.

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The Draw-a-Person Test for Assessing Body Representation following Adapted Physical Activity in persons with mental and neurocognitive disorders

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Body representation is a multidimensional construct that emerges from the integration of proprioceptive, vestibular, and visual information and plays a fundamental role in postural control, motor behavior, and the sense of bodily self (Tsakiris, 2010; Gallagher, 2009). Alterations in body representation have been reported in several neurological and psychiatric disorders and may affect not only motor performance but also cognitive, emotional, and social functioning. Although various clinical tools have been used to assess body representation and body schema, evidence supporting their application in rehabilitation settings remains limited. The Draw-a-Person (DAP) Test has been proposed as a simple and non-invasive tool for exploring body representation through graphic expression. The present study aimed to investigate changes in DAP Test performance following an adapted physical activity (APA) program in individuals with mental disorders and to examine its relationship with neuro-motor performance. We hypothesized that the DAP Test could represent a useful clinical tool for assessing body representation, that DAP Test scores would correlate with neuro-motor performance, and that both measures would improve following participation in an APA program. *Methods*: Fourteen adults (6 females and 8 males; aged between 21 and 60 years) diagnosed with mental disorders were recruited from the HARMONIA Residential Rehabilitation Facility and Day Care Center (Pesaro-Urbino, Italy). The study followed a pre–post intervention design comprising three phases: baseline assessment, participation in an APA program, and post-intervention assessment. Participants completed the DAP Test and a battery of neuro-motor tests before and after the intervention. The APA program consisted of 20 supervised sessions delivered over approximately four months. Changes in DAP Test scores and neuro-motor performance were analyzed, and correlations between the two outcome measures were explored. *Results*: Mean DAP Test scores increased from 18.00 at baseline to 27.86 following the intervention. A paired Student's *t*-test demonstrated a statistically significant improvement ($p < 0.05$). Neuro-motor assessments also showed improvements in balance, coordination, and motor control. Furthermore, DAP Test scores were strongly correlated with neuro-motor performance both before ($r = 0.79$) and after ($r = 0.76$) the intervention, suggesting a close relationship between body representation and motor function. *Conclusions*: Participation in an adapted physical activity program was associated with improvements in both body representation, as assessed by the DAP Test, and neuro-motor performance in individuals with mental disorders. The observed relationship between DAP Test scores and neuro-motor outcomes suggests that the DAP Test may represent a promising complementary tool for exploring changes in body representation within rehabilitation settings. However, the relatively small sample size and the absence of a control group limit the generalizability of these findings. Further studies involving larger samples and more rigorous study designs are needed to clarify the clinical value of the DAP Test and its responsiveness to rehabilitation interventions.

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Active and Inactive Adolescents: Differences in Perceived Quality of Life and Psychophysical Well-Being

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Adolescence represents a critical stage of human development, characterized by profound physical, cognitive, emotional, and social changes that contribute to the formation of personal and social identity (Sawyer et al., 2018). During this developmental period, individuals undergo continuous processes of adaptation and reorganization, in which self-image, interpersonal relationships, and the acquisition of competencies for adult life play a central role. In this context, perceived quality of life becomes a key construct for understanding adolescent well-being, as it integrates physical, psychological, relational, and social dimensions into a comprehensive evaluation of daily functioning (Ravens-Sieberer et al., 2005). In recent years, an increasing body of literature has highlighted the progressive diffusion of sedentary behaviors among adolescents, accompanied by a substantial rise in the use of digital devices and screen-based activities. These changes in lifestyle patterns have been associated with negative outcomes in several domains of well-being, including perceived health status, sleep quality, emotional balance, and social functioning (González Valeiro et al., 2023; World Health Organization, 2020). Reduced levels of physical activity during adolescence have been identified as a relevant public health concern, given their potential impact not only on physical health but also on psychological and relational development. Within this scenario, extracurricular sports participation is increasingly recognized as a relevant educational and developmental context capable of counteracting sedentary lifestyles and promoting active engagement. Sport, in this sense, is not limited to the improvement of motor performance or physical fitness but should be understood as a structured educational environment in which adolescents can experience meaningful opportunities for social interaction, cooperation, emotional regulation, and personal responsibility. These experiences contribute to the development of transferable life skills and support broader processes of identity construction (Fraser-Thomas et al., 2005; Holt et al., 2017).

From a theoretical perspective, these mechanisms can be interpreted considering the Positive Youth Development (PYD) framework (Lerner et al., 2005), which emphasizes the role of structured developmental contexts in promoting positive trajectories of growth. According to this perspective, participation in organized activities such as sport can foster the development of competence, confidence, connection, character, and caring, thereby contributing to a more adaptive developmental pathway during adolescence. The present study investigated the relationship between extracurricular sports participation and perceived quality of life in adolescence using the KIDSCREEN-52 questionnaire (Ravens-Sieberer et al., 2005), a validated instrument designed to assess Health-Related Quality of Life (HRQoL) across multiple dimensions. The sample consisted of 311 adolescents aged 13 to 15 years, who were divided into two groups based on their participation in structured extracurricular sports activities: sports participants and non-participants. Participation was defined as regular involvement in organized sport contexts outside of school.

Data were collected through a standardized questionnaire and analyzed using descriptive statistics and independent-samples t-tests to compare the two groups across the ten dimensions of the KIDSCREEN-52. In addition, effect sizes were calculated using Cohen's d to complement statistical significance with an evaluation of the practical relevance of observed differences, independently of sample size. The results indicate significant differences between groups in several dimensions of perceived quality of life. Sports participants reported higher levels of physical well-being, self-perception, and social support and peer relationships compared to non-participants. These differences

were statistically significant and, in the case of physical well-being, showed a large effect size, suggesting a substantial disparity between groups. Smaller but still significant differences were observed in mood and emotions and autonomy, indicating a more positive emotional experience and a greater perception of independence among adolescents engaged in sports activities. In contrast, no statistically significant differences were found in psychological well-being, parent relations and family life, school environment, or bullying experiences. These findings suggest that certain domains of perceived quality of life may be less directly influenced by sports participation and more strongly determined by broader contextual, familial, and school-related factors that extend beyond extracurricular engagement.

Overall, the findings suggest that extracurricular sports participation is selectively associated with specific dimensions of adolescents' perceived quality of life, with stronger effects on physical, self-related, and social domains, consistent with previous evidence on the relationship between organized sport and adolescent well-being (Méndez-Giménez et al., 2022). From an educational perspective, these results highlight the potential role of sport as a meaningful developmental context capable of supporting adolescents' well-being, while also emphasizing the multidimensional and context-dependent nature of quality of life during this stage of development.

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Nonlinear Pedagogy in Physical Education Teaching: Promoting Executive Functions Development

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Over the last two decades, growing interest in educational neuroscience has highlighted the importance of understanding how movement-based experiences can influence cognitive development during childhood. In this perspective, learning is conceived as a dynamic, experience-dependent process shaped by continuous interactions between the brain, the body, and the environment, where educational contexts play a key role in supporting adaptive neural plasticity (Immordino-Yang & Damasio, 2007; Kolb & Gibb, 2011).

Developmental age is marked by high neuroplasticity, where movement and play support cognitive development. Physical activity strengthens executive functions through repeated perception–action cycles, including attention, inhibition, working memory, and cognitive flexibility (Best, 2010; Diamond, 2015, 2020). Recent evidence further suggests that cognitively enriched and variable motor experiences may enhance visual processing speed and attentional efficiency, particularly when tasks require rapid adaptation to changing environmental constraints.

Nonlinear Pedagogy (NLP), grounded in Ecological Dynamics, offers an alternative to traditional linear instructional models. Rather than relying on prescriptive sequences and repetitive drills, NLP emphasizes exploration, variability, and the manipulation of task, environmental, and individual constraints to facilitate adaptive learning (Chow et al., 2021; Newell, 1986).

By manipulating task and environmental constraints, NLP encourages children to develop functional movement solutions while simultaneously engaging attentional, perceptual, and decision-making processes. This study investigated the effects of an NLP-based physical education intervention on attention and processing speed in primary school children.

A total of 165 primary school children (mean age = 7.21 ± 0.93 years) participated in a 16-week quasi-experimental study, divided into an experimental group (n = 98) and a control group (n = 67). The experimental group followed PE lessons designed according to NLP principles, while the control group engaged in traditional, instruction-based PE. The intervention consisted of 32 sessions structured around exploratory, game-based, and variable movement tasks, systematically adapted by teachers in response to learners' behaviours. The pedagogical focus was on creating enriched environments in which perception, decision-making, and action were continuously integrated.

Cognitive performance was assessed using the Witty SEM system (Microgate, Italy), which enables the measurement of attentional processes, reaction time, and visual processing speed through interactive motor-cognitive tasks. The system provides high ecological validity by integrating whole-body movement with perceptual and cognitive demands. Two experimental protocols were used: the Divided Attention task, assessing selective attention, inhibitory control, and cognitive flexibility under time pressure; and the Hawk Eye task, evaluating visuospatial scanning and visuomotor processing speed through rapid target identification across multiple stimuli.

Statistical analyses revealed significant group × time interactions for both cognitive measures. The experimental group showed greater improvements in divided attention ($p = 0.014$ for both levels) and visual processing speed ($p < 0.001$), with larger effect sizes observed at higher task complexity. These results indicate that NLP-based PE may facilitate the development of core executive functions in early childhood, particularly under conditions requiring rapid attentional shifts and perceptual

discrimination. Motor competence was included as a covariate, ensuring that cognitive improvements could be interpreted independently of baseline motor skill differences.
The findings support the effectiveness of Nonlinear Pedagogy as an educational framework capable of enhancing executive functions through cognitively enriched movement experiences. The intervention should be understood not as a fixed protocol, but as continuous adaptive manipulation of constraints by the teacher. Effectiveness depends on responsive adjustments to tasks, space, rules, and social setups, shifting emphasis from protocol fidelity to adaptive fidelity in pedagogical practice. These results align with ecological dynamics, according to which learning emerges through the continuous interaction between individual, task, and environmental constraints. From an educational perspective, the study highlights the importance of the teacher as a designer of adaptive learning environments capable of integrating motor, cognitive, and social development.
In conclusion, the present findings support the effectiveness of NLP-based PE in enhancing attentional capacity and visual processing speed in primary school children. These results highlight the value of learning environments that integrate cognitive, motor, and perceptual demands through variability and exploration. Further research with larger samples and longer intervention periods is needed to confirm these findings and better understand the mechanisms underlying motor-cognitive development in nonlinear learning environments.

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SUSTAINability in Play: Physical Exercise, Health and Inclusion for Sustainability in Sport

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In the contemporary context, physical exercise and sport play a strategic role in promoting health, psychophysical well-being, social inclusion, and sustainable development. Physical activity is not merely a means of improving performance, but a key factor influencing lifestyles, social participation, and the quality of communities. From this perspective, sustainability in sport and exercise sciences requires the integration of educational, preventive, social, and organizational dimensions. Despite the recognition of physical activity as a determinant of public health, fragmented approaches persist across exercise programs, adapted physical activity, professional education, and the management of sport organizations. Environmental, Social, and Governance (ESG) principles, aligned with the United Nations 2030 Agenda for Sustainable Development, provide a valuable framework for rethinking sport as a sustainable, inclusive, and well-being-oriented system.

The SUSTAINPLAYNET project, developed within the University Research Project (PRA) of Pegaso University, examines the relationship between physical exercise, health, inclusion, and sustainability through an interdisciplinary approach. The project aims to show how research in sport and exercise sciences can contribute to an ecosystem-based model of well-being by connecting physical activity, health, social participation, and sustainable governance. A documentary and thematic analysis was conducted on the scientific outputs produced within the PRA project, with a focus on physical exercise, adapted physical activity, physical literacy, professional education, and psychophysical well-being. The studies were organized into thematic areas in order to identify convergences among health, inclusion, physical education, and the sustainability of sport in light of ESG principles and the ecosystem approach to well-being.

The analysis identified three integrated dimensions. The first concerns physical exercise as a tool for promoting health throughout the lifespan. The studies examined indicate that structured physical activity programs can enhance motor skills, physical fitness, and disease prevention, particularly when they are tailored to individual characteristics and diverse contexts. The second dimension concerns physical activity, inclusion, and social participation. Adapted physical activity and accessible programs foster the participation of individuals with diverse abilities and functional conditions, contributing to the creation of inclusive environments, the reduction of barriers, and stronger community cohesion.

The third dimension concerns organizational sustainability and sport governance. The integration of ESG principles allows sport and educational organizations to be understood as responsible systems grounded in service quality, transparency, innovation, and a people-centered approach. Within this framework, the education and training of sport and exercise science professionals assume a strategic role. Sustainability in sport cannot be reduced solely to its environmental dimension; rather, it should be understood as a systemic process integrating health, education, inclusion, and organizational development. The ecosystem approach to well-being recognizes physical activity as a driver of both individual and collective value, capable of connecting health prevention, social development, and organizational innovation.

Nevertheless, challenges remain, particularly regarding the fragmentation of interventions and the need for more integrated models supported by scientific evidence and multidimensional evaluation. Future research should further investigate the relationships among physical activity, health, inclusion, and organizational sustainability.

In conclusion, SUSTAINPLAYNET proposes an integrated vision of sustainability in sport and exercise sciences, identifying physical exercise as a strategic tool for promoting health, inclusion, and sustainable development. Sport, physical activity, and governance are interpreted as interdependent components of a system oriented toward individual and collective well-being.

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The Teaching in Motion Framework: Correlations Between Movement Quantity and Teaching Effectiveness

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Teaching effectiveness in physical education depends not only on technical and methodological competencies but also on teachers' ability to use movement and spatial presence as pedagogical resources. Grounded in dynamic systems theory and ecological approaches to learning, this study conceptualizes physical education teaching as an embodied, multimodal, and relational process in which teachers' movement behaviors shape students' opportunities for action, task interpretation, and engagement. Spatial movement is thus interpreted as a relational resource expressing vitality, pedagogical intentionality, empathy, and self-control (Shapiro et al., 2022, Shapiro et al., 2024).
The study investigated the relationship between teachers' movement quantity, pragmatic profiles, and teaching effectiveness. Pragmatic profiles were identified through a linguistic-communicative analysis. Three profiles were distinguished: the tutorial-adaptive (TA) profile, oriented toward the individual student and characterized by adaptive and personalized interactions; the rhythmic-orchestral (RO) profile, focused on group regulation as a collective system; and the technical-regulatory (TR) profile, mainly oriented toward technical efficiency, normative control, and task management.
The study involved 340 students and 28 physical education teachers. Measurements were conducted during lessons. Teacher mobility and movement intensity were assessed using Garmin trackers, a 9-square gym grid, and Axivity AX3 accelerometers. Teachers' weekly physical activity, self-control, and empathy were evaluated through the International Physical Activity Questionnaire (IPAQ), the Self-Control Scale, and the Empathy Scale for Teachers. Students' physical activity, enjoyment, self-efficacy, and motor coordination were assessed using PAQ-C, PACES, PSES, and KTK.
The findings revealed differences among the three pragmatic profiles in teachers' movement behaviors. Step count differed significantly across profiles ($F=18.31$, $p<0.001$, $\eta2=0.68$), with RO and TA teachers showing higher values than TR teachers (RO vs TR: $p<0.001$; TA vs TR: $p=0.001$). This result supports the interpretation of RO and TA as more spatially dynamic profiles, whereas TR teachers appeared more static and more oriented toward centralized and normative lesson management. This pattern was confirmed by gym zone transitions ($F=11.25$, $p=0.004$, $\eta2=0.38$): TR teachers performed fewer zone changes than TA ($p=0.022$) and RO teachers ($p=0.014$), indicating reduced use of space as a teaching resource.
Movement quantity was also associated with physiological and intensity-related indicators. Mean heart rate differed across profiles ($F=9.11$, $p=0.011$, $\eta2=0.29$), with TA teachers showing higher values than both RO ($p=0.022$) and TR teachers ($p=0.017$). Activity intensity during lessons varied across profiles, with significant differences in sedentary ($F=11.36$, $p=0.003$, $\eta2=0.39$), light ($F=12.10$, $p=0.002$, $\eta2=0.44$), and moderate activity ($F=12.05$, $p=0.002$, $\eta2=0.41$), but not in vigorous activity ($F=0.63$, $p=0.728$, $\eta2=0.001$). TA teachers spent more time in sedentary intensity than RO and TR teachers (RO vs TA: $p=0.043$; TA vs TR: $p=0.003$), and also showed greater light-intensity activity (RO vs TA: $p=0.026$; TA vs TR: $p=0.002$). For moderate activity, the significant difference emerged between TA and TR ($p<0.001$). These data suggest that TA teachers combined a broad range of intensities with frequent relational positioning.
Differences among profiles extended beyond movement quantity and were associated with teachers' personal competencies. IPAQ scores showed significant differences among profiles ($F=23.31$, $p<0.001$, $\eta2=0.85$), with RO and TA teachers reporting higher weekly physical activity than TR

teachers (RO vs TR: $p<0.001$; TA vs TR: $p=0.035$). Self-control also differed significantly ($F=18.74$, $p<0.001$, $\eta2=0.67$), with TR teachers reporting lower levels than RO ($p=0.003$) and TA teachers ($p<0.001$). Empathy differed across profiles too ($F=7.39$, $p=0.025$, $\eta2=0.21$), with TA teachers showing higher levels than TR teachers ($p=0.011$). These findings suggest that more dynamic teaching profiles are not defined only by movement frequency, but also by emotional regulation and relational responsiveness (Mainhard et al., 2022).

Student outcomes showed a more selective pattern. Motor competence did not differ among the three profiles ($F=1.89$, $p=0.388$, $\eta2=0.001$), with all groups positioned around normal coordination levels. Similarly, no differences emerged in children's enjoyment ($F=1.86$, $p=0.394$, $\eta2=0.001$) or weekly physical activity ($F=0.17$, $p=0.916$, $\eta2=0.001$). However, self-efficacy differed significantly ($F=4.67$, $p=0.047$, $\eta2=0.11$), with children taught by TA teachers reporting higher levels than those taught by TR teachers ($p=0.031$). This result suggests that adaptive, student-centered movement and communication may contribute especially to students' perceived competence (Öznacar et al., 2017).

In conclusion, the study highlights the role of movement quantity, spatial organization, physiological engagement, and socio-emotional competencies in physical education teaching effectiveness. The findings support the view that teaching is an embodied and relational process in which movement and spatial presence function as pedagogical resources capable of promoting student engagement, perceived competence, motor learning opportunities, and teachers' professional well-being. These results also underline the importance of integrating embodied and multimodal perspectives into teacher education in physical education.

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Inline Skating as a physical education intervention in Primary Schools

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Research in education and movement sciences increasingly regards movement as a cognitive medium for cognitive development rather than mere bodily exercise: structured motor activities constitute privileged contexts for the development of executive functions (EFs), the top-down control processes underpinning self-regulation and learning (Diamond, 2013; Miyake et al., 2000). Evidence indicates that physical activity is associated with improvements in attention and EFs during the school years, with the most marked benefits when the task is cognitively demanding (Best, 2010; Barenberg et al., 2011): it is the complexity of the task, the demand to coordinate perception, decision and action under changing conditions, that engages inhibitory control, working memory and cognitive flexibility. Primary school represents a critical phase for intervention, since EFs pass through a sensitive developmental window in this period (Best & Miller, 2010).

Among complex motor activities, inline skating offers a particularly promising educational profile: an unstable, gliding base of support requires continuous postural regulation; pushing, gliding, turning and braking form motor chains demanding sequential planning; obstacles and route variations test cognitive flexibility, while loss of balance provides an immediate error threshold prompting monitoring and correction. Its predictable sequences and repeatable routines also make it highly supportive for pupils with special educational needs (SEN), including autism spectrum disorder (ASD) (Cottini, 2017). Within the biopsychosocial perspective of the ICF-CY (WHO, 2007), the study reads participation as the interaction between personal conditions and contextual factors: in a Calabrian territory marked by educational poverty, where school is for many the only access to structured motor experiences, the intentional design of the learning environment (Castoldi, 2020) becomes the enabling condition of the intervention and takes on an equity function (Booth & Ainscow, 2014).

Method

The study adopts a qualitative exploratory design with descriptive quantification of observations, deliberately advancing no causal claims. Between October 2024 and May 2025, an inline skating programme was delivered during curricular physical education hours (48 sixty-minute sessions) at a comprehensive school in Calabria, involving the entire population of twelve fourth- and fifth-grade classes: 184 pupils, including 14 with SEN, two with ASD. The didactic progression moved from familiarisation and static balance to dynamic balance and propulsion, then to changes of direction and braking, and finally to articulated sequences and cooperative circuits, within a setting organised by three constant criteria: predictability and safety, cognitive accessibility, stimulation of autonomy and interaction.

Data were collected through three complementary sources: purpose-built observation grids of 15 indicators anchored to ICF-CY codes, organised into five areas and mapped onto the three target EFs, completed in two four-session windows (PRE, October; POST, May) on a 0-4 ordinal scale; a staged educational diary compiled at three points and analysed through reflexive thematic analysis (Braun & Clarke, 2006); and PRE/POST context sheets documenting the transformations of the setting. Integration occurred through a convergence matrix classifying evidence as convergent,

complementary or dissonant; the quality criterion is credibility rather than internal validity (Lincoln & Guba, 1985).

Results

The diary yielded three cross-cutting themes: from impulse to shared rule (inhibitory control acquired through mediators such as the sound stop signal and the fixed starting ritual); flexibility as a frontier, the demand the group found hardest to consolidate; and an emotional arc from dispersive euphoria to competent satisfaction. Descriptively, the mean profile across the fifteen indicators rose from 1.32 to 2.56; observations at levels 0-1 fell from 58.7% to 16.8% of the 2,760 pupil-indicator pairs, while levels 3-4 rose from 11.9% to 53.4%. By target function, inhibitory control showed the largest mean change (+1.30), followed by working memory (+1.23) and cognitive flexibility (+1.13), the latter remaining at levels 0-1 for 62 pupils. Change was homogeneous across grades and genders; pupils with SEN started lower (0.90 vs 1.36) but improved comparably (+1.19 vs +1.24). The most probative convergence is a negative one: grids, diary and context sheets independently identified flexibility, planning and self-monitoring as the critical area, whose dedicated device, transitions between zones, was introduced only late in the cycle.

Discussion and conclusions

The differential profile of change reproduces the developmental order described in the literature, with inhibitory control maturing earlier and shifting consolidating later (Best & Miller, 2010; Diamond, 2013): the fragility of flexibility is not an anomaly of the intervention but the point where task demand meets the developmentally latest component. The covariation between transformations of the setting and of behaviours, documented in parallel by context sheets and grids, constitutes the interpretive core: zones of graduated difficulty, visual signage and stable routines operated as didactic mediators transforming barriers into facilitators. The comparable progress of pupils with SEN suggests the facilitators worked for the whole group, the expected profile when environmental conditions of participation change. The study delivers no proof of effectiveness but a repertoire of inclusive design conditions and working hypotheses, to be verified in a planned quasi-experimental study using standardised measures (BIA-R battery; Tower of London).

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Beyond Pharmacological Enhancement: Digital Technologies and Motor Didactics as Ethical Vectors for Doping Prevention

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The persistent challenge of pharmacological enhancement in sport demands a pedagogical shift from a predominantly reactive anti-doping model, centred on biological testing, surveillance, and sanctions, towards a more proactive educational model capable of addressing the motivational, cultural, and psycho-behavioural roots of doping behaviour. Although medical screening and regulatory deterrence remain indispensable for protecting athlete health and competitive fairness, they most often intervene only after risk-taking attitudes, distorted performance beliefs, and normalisation of pharmacological shortcuts have already taken root. Within the framework of motor learning and motor didactics, doping can therefore be interpreted not only as a violation of rules, but also as an educational failure: a breakdown in the athlete's capacity to understand performance as a long-term, embodied, and ethically situated process that extends beyond the mere athletic performance.

This conceptual study examines how digital technologies and motor didactics may be integrated as ethical vectors for doping prevention. Building on values-based anti-doping education and research on the spread of performance-enhancing drug use among young athletes [1,2], the paper argues that doping prevention should not be limited to communicating risks or enacting prohibitions. Instead, educational interventions should help athletes develop critical awareness of training processes, recovery, fatigue, adaptation, and the meaning of performance itself. In this perspective, emerging tools such as wearable sensors, biofeedback systems, inertial measurement units, and data-driven video analysis can be used not merely to optimise performance, but to make the dimensions of motor learning more visible and teachable.

When integrated into pedagogically grounded coaching practice, digital technologies can provide real-time or near-real-time feedback on movement quality, neuromotor adaptation, asymmetry, load management, recovery, and biomechanical efficiency [3]. These data may function as mediators between the coach, the athlete, and the motor task, fostering reflection and awareness rather than sterile measurement. For example, feedback on gait, posture, coordination, or fatigue can help athletes recognise that performance improvement is the result of progressive adaptation, learning, and self-regulation, rather than of immediate enhancement. Additionally, it offers an objective means to assess injury risk and therefore also acts as an preventive tool against overuse/misuse injuries. In this way, the didactic use of technology can redirect attention from the obsession with the result, which may foster vulnerability to pharmacological shortcuts, toward mastery of the movement process, health literacy, and responsible decision-making.

The proposed approach is particularly relevant in youth and developmental sport contexts, where athletes are still constructing their values and body image, and developing their personal concept of success. Digital feedback, if used ethically and pedagogically, may strengthen autonomy by allowing athletes to participate actively in interpreting their own data, setting realistic goals, and understanding the consequences of overload, inadequate recovery, or pharmacological enhancement. At the same time, the study emphasises that technology is not inherently ethical. Without appropriate educational framing, digital tools may reinforce performance pressure, surveillance, comparison, and reductionist views of the body as a set of metrics to be maximised. Therefore, the central issue is not simply the

adoption of technology, but the development of digital-ethical competencies among coaches, kinesiologists, physical educators, and sport organisations.
Accordingly, this paper proposes a model of technology-supported anti-doping education based on four interconnected principles: process-centred motor learning, embodied self-awareness, critical interpretation of performance data, and ethical responsibility. Within this model, the coach or educator does not use digital technologies solely to identify deficits or accelerate performance, but to create meaningful learning situations in which athletes can understand their bodies, respect physiological limits, and recognise the risks of pharmacological enhancement for health, personal identity, and sporting integrity. Such an approach may complement traditional anti-doping systems by acting earlier in the prevention pathway, before doping intentions consolidate into behaviour.
In conclusion, integrating digital technologies with motor didactics and ethical physical education may offer a scalable, preventive, and athlete-centred contribution to the fight against doping. By transforming data into reflective learning, and performance monitoring into self-awareness, sport education can help preserve the integrity of competition while protecting the health and dignity of athletes. Future research should develop and evaluate structured educational protocols that combine digital feedback with values-based anti-doping curricula, particularly in youth, elite-development, and coach-training settings.

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Empowering Physical Education Teachers: AI-Driven Personalized Learning in Schools

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Despite the health benefits of early physical activity, Italian adolescents face high inactivity and sports dropout. School Physical Education (PE) must counter this by shifting from technical performance toward a sustainable, oblique, and inclusive approach that prioritizes long-term adherence, enjoyment, and intrinsic motivation.

Background and Theoretical Framework

Designing personalized learning pathways requires solid instructional frameworks like Universal Design for Learning (UDL), which creates individualized, differentiated environments for everyone without discriminatory distinctions, emphasizing the role of emotions in motivation and educational equity. Parallelly, Vygotsky's Zone of Proximal Development (ZPD) helps the PET identify the gap between a student's actual developmental level and their potential level when guided. Within this framework, an oblique teaching approach allows students to work at their own competence level within the same activity, ensuring they experience success and avoiding both the boredom of simple drills and the frustration of tasks far above their competence. Within this pedagogical paradigm, Generative AI and Large Language Models (LLMs) emerge as promising supportive tools for lesson design. However, scientific literature underscores significant limitations: an uncritical reliance poses the risk of failing to comprehend system boundaries, as LLMs often fail to grasp specific objectives or complex cultural contexts. Thus, AI must serve as a mediator of knowledge and a tool for professional reflection and organization and not as a substitute of the educational and pedagogical PE's role. Its reliability follows the "garbage in, garbage out" principle: vague or incomplete data render unreliable results, while precise and detailed prompt generate more accurate outputs.

Methods

This exploratory study was designed as a comparative documentary analysis between two AI-supported instructional design conditions using ChatGPT EDU. The target task consisted of planning a four-lesson basketball shooting mesocycle for a first-year Italian middle school class comprising 23 students, including 5 foreign minors and 1 student with a disability.

In Case 1, where no data was provided, the AI generated lesson plans based solely on general class descriptions and pedagogical guidelines. In Case 2 the AI was provided with an authentic student dataset containing physical fitness measurements, physical activity levels (PDPAR), and enjoyment scores (PACES). The resulting documents were analysed across five interpretative dimensions: pedagogical coherence, psychological relevance, sociological implications, inclusion, and sport and exercise science consistency.

Results and Discussion

The comparative analysis demonstrates that incorporating real class data profoundly changes the nature and operational quality of the planning output, significantly increasing its ecological validity. In the data-informed condition, ability levels are operationalized according to specific task domains (static, dynamic, tactical, and global situations), enabling a flexible, oblique approach where group assignments vary dynamically based on the proposed motor problem. Crucially, this programming model separates quantity from complexity, altering the workload logic. For advanced groups, the AI complicates the exercises by adding decision-making demands, time pressure, defensive opposition, and tactical reading, but decreases the estimated individual shooting volume by 38.5% compared to

the generic condition. Advanced levels replace high volume with higher cognitive, neuromuscular, and tactical engagement. Conversely, in the generic programming condition (less data), the AI relies on a linear, cumulative model that directly associates higher competence with an increased number of repetitions. To make an activity difficult for advanced levels, it linearly amplifies the estimated shooting volume (up to 322 shots), assuming proficient students simply need more volume. While increasing executions, the drills remain structurally repetitive, simple in situational complexity, and less responsive to actual sports practice.

Conclusions

The primary potential of this study lies in demonstrating that data-informed AI bridges theory and practice by translating abstract concepts (UDL, ZPD) into concrete operational scripts. Pre-arranging groups and adaptive constraints based on authentic class profiles significantly reduces the teacher's real-time cognitive and decision-making load during gym implementation. Since the generic version excels in pedagogical language and formative rubrics, and the data-informed version provides a superior operational script, the study introduces a hybrid integration strategy as a key methodological prospect. Combining the educational frameworks of the generic output with the localized, data-driven operational matrices of the data-informed plan optimizes lesson design. Ultimately, AI remains a mediator; professional teacher judgment remains completely indispensable to monitor safety, ethical sensitivity, adherence to sport-specific principles and dynamic tracking in authentic PE settings.

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Does Sports Competence Affect Physical Activity Enjoyment During Preadolescence?

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In sports and physical activity (PA) field, enjoyment is a positive affective response to such experience (Scanlan & Simons, 1992) and it can also be considered an important factor in promoting healthy and active lifestyles such as regular PA among school-aged guys (Carraro et al., 2008). The same authors present here a replication study, with a more robust sample and after twelve years, also marked by a pandemic event. The aim of the present study was to investigate the effects of perceived sports competence on the enjoyment caused by PA practice (Scarpa & Nart 2012). Methods: Participants were 794 pupils (403 boys and 391 girls) aged between 12 and 14 years (M = 13.2; SD = .86). Written informed consent was obtained from the parents of all participants before inclusion in the study. The Physical Self-Description Questionnaire-Short (PSDQ-S; Scarpa et al., 2010) and the Physical Activity Enjoyment Scale (PACES; Carraro et al., 2008) were administered. Pearson's correlation test was used to measure the association between variables. A multiple linear regression analysis was conducted to investigate the correlation between PSDQ-S scale's scores (independent variables) and PACES total score (dependent variable). Results: Pearson correlation test revealed the following positive associations between PSDQ-S variables and PACES total score: endurance ($r = .527$, $p < .001$); flexibility ($r = .206$, $p < .001$); strength ($r = .365$, $p < .001$); coordination ($r = .427$, $p < .001$); sport skill ($r = .546$, $p < .001$). Multiple linear regression analysis showed the following score indices: Standard Error = 7.76; $t = 20.79$; $R2 = .363$; $F(5,388) = 44.13$; $p < .001$. Conclusions: Results highlighted positive associations between physical self-concept scales and PA enjoyment. The hypothesis that perceived sports competence can be considered a good predictor of PA enjoyment was confirmed.

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The Teaching in Motion Framework: A Qualitative and Quantitative Analysis of the Pragmatic Profiles of Physical Education Teachers

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This contribution presents the Teaching in Motion Framework, a multidimensional model for analysing physical education teaching as an embodied, communicative and pedagogical practice. Educational meaning is constructed through language, voice, gesture, space, rhythm and interaction; the teacher's body therefore acts as a semiotic and pedagogical tool for guiding attention, regulating action, sustaining motivation and mediating motor learning. The study aimed to identify pragmatic profiles of physical education teachers using Searle (1969), Mortara-Garavelli (1993), and McNeill (1992;2005) classifications and examine their relationships with teaching styles, didactic competencies, lesson organization and students' activity.

The research involved 340 primary and secondary school students and 28 teachers. Teachers' communication was analysed through pragmatic, rhetorical and gestural frameworks, considering speech acts, rhetorical strategies and McNeill's gesture categories. Lesson videos were examined through IESPES, IFITS and SOFIT to assess didactic competencies, methodological choices, lesson context, teacher interaction and students' physical activity.

Three profiles were identified. The tutorial-adaptive profile (TA; n=6) is oriented toward the individual student and uses supportive, adaptive and relational communication. The rhythmic-orchestral profile (RO; n=8) focuses on the group and is marked by rhythmic coordination, collective directives, broad gestures and spatial organization. The technical-regulatory profile (TR; n=14) is centred on technique, rules and performance control, using explicit directives, regulatory gestures and strategic supervision.

IESPES results showed significant differences in didactic competencies. The total score was higher in TA (4.6±0.05) than RO (4.0±0.16) and TR (3.8±0.12), with a significant overall effect ($p<0.001$, $\eta2=0.68$) and post-hoc differences between RO and TA ($p=0.049$), RO and TR ($p=0.05$), and TA and TR ($p<0.001$). TA also showed stronger voice and paralanguage (TA=5.0±0; RO=4.3±0.51; TR=3.6±0.52; $p<0.001$, $\eta2=0.63$), with significant differences between RO and TA ($p=0.041$) and TA and TR ($p<0.001$). Non-verbal communication also differed (TA=4.7±0.51; RO=4.1±0.35; TR=3.8±0.57; $p=0.017$, $\eta2=0.26$), especially between TA and TR ($p=0.013$). Didactic coherence was highest in TA (5.0±0), compared with RO (4.1±0.35) and TR (4.0±0) ($p<0.001$, $\eta2=0.81$). Significant differences also emerged for psychological references ($p=0.007$, $\eta2=0.345$) and personal competencies ($p<0.001$, $\eta2=0.82$), both favouring TA. In the organizational dimension no relevant differences emerged (RO=3.3±0.5; TA=3.1±0.51; TR=3.2±0.45; $p=0.835$), suggesting that the profiles differed more in communicative and pedagogical quality than in basic organizational references.

IFITS analysis highlighted differences in methodological organization. RO teachers used the widest variety of teaching styles (3.8±1.4), followed by TA (2.5±1.0), whereas TR relied on only one style (1.0±0.0; $p<0.001$, $\eta2=0.79$). TR was mainly characterized by practice-based instruction (68.2±4.5%), significantly higher than RO (9.2±13.6%) and TA (9.8±8.3%) ($p<0.001$, $\eta2=0.74$; RO vs TR: $p<0.001$; TA vs TR: $p=0.002$). Command style differed across profiles (RO=20.5±11.8%; TA=29.0±15.3%; TR=0%; $p<0.001$, $\eta2=0.74$), with RO and TA higher than TR. Reciprocal style was present mainly in RO and TA ($p=0.032$, $\eta2=0.20$), while self-check and guided discovery were characteristic of RO (self-check: 7.5±8.9%, $p<0.001$, $\eta2=0.49$; guided discovery: 10.1±14.3%,
$p<0.001$, $\eta2=0.52$). Divergent discovery also differed across profiles (RO=4.5±4.4%; TA=3.6±6.3%; TR=0%; $p=0.009$, $\eta2=0.30$). Inclusion did not differ significantly ($p=0.174$), and no time was coded as going beyond. This confirms that methodological plurality was concentrated mainly in RO and TA

groups. Management and dialogue were higher in RO (44.2±5.4%) and TA (49.5±4.0%) than in TR (31.9±4.5%; $p<0.001$, $\eta2=0.75$). Thus, RO and TA appeared more flexible and multimodal, whereas TR was more task-centred.
SOFIT complemented these findings by showing different lesson ecologies. TR lessons produced higher moderate-to-vigorous physical activity (71.8±8.5%) than RO (59.3±11.1%) and TA (49.2±10.9%) ($p=0.002$, $\eta2=0.45$), with a significant TA vs TR difference ($p=0.002$). Conversely, sedentary time was lower in TR (28.1±8.3%) than in RO (40.5±11.3%) and TA (50.4±10.7%) ($p=0.002$, $\eta2=0.45$). However, RO and TA devoted more time to knowledge construction (RO=32.2±7.3%; TA=31.3±6.1%; TR=12.9±6.3%; $p<0.001$, $\eta2=0.64$) and skill learning (RO=37.0±11.4%; TA=39.6±8.1%; TR=25.5±5.2%; $p=0.005$, $\eta2=0.36$), whereas TR proposed more game-based activity (45.2±10.6%) than RO (12.3±13.6%) and TA (13.11±6.4%) ($p<0.001$, $\eta2=0.69$). Management time did not differ significantly ($p=0.878$, $\eta2=0.01$). RO showed the highest in-class interaction with students (26.7±7.6%), followed by TA (22.4±2.9%) and TR (18.3±4.1%) ($p=0.006$, $\eta2=0.35$), especially compared with TR ($p=0.004$).
Overall, teaching effectiveness in physical education cannot be interpreted through a single indicator. TR appears effective in producing high motor engagement through structured practice and games, whereas TA and RO show stronger didactic quality, methodological flexibility, interactional density and learning-oriented organization. The Teaching in Motion Framework offers a tool for observing how teachers combine body, voice, gesture, space and interaction, and for supporting teacher education programs aimed at balancing technical regulation, adaptive communication and meaningful student engagement.

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Sport Participation and School Anxiety: The Role of Different Sports Disciplines in a Multiple Regression Model

Sorrentino Clarissa
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Anxiety represents one of the most relevant emotional factors influencing children's academic experiences, psychological adjustment, and educational outcomes. Within school contexts, anxiety may emerge as a broad emotional discomfort related to school participation and learning demands (school anxiety) or as a domain-specific reaction associated with mathematics learning (mathematics anxiety). Both dimensions have been associated with lower academic achievement, reduced engagement, decreased self-efficacy, and less adaptive school experiences (Ashcraft, 2002; Dowker et al., 2016).

In recent years, growing attention has been devoted to the potential role of sport participation as a protective factor for children's psychological well-being. Systematic reviews and meta-analyses have consistently shown that engagement in sport and physical activity is associated with lower emotional distress and better mental health outcomes among children and adolescents (Biddle & Asare, 2011; Rodriguez-Ayllon et al., 2019; Panza et al., 2020). However, sport participation should not be considered a unitary experience.

Different sport disciplines involve distinct combinations of social interaction, emotional regulation, attentional engagement, and self-regulatory demands, which may generate differentiated associations with school-related outcomes. Team sports may provide opportunities for social support, cooperation, and collective goal orientation, whereas individual sports may require stronger self-monitoring, concentration, and autonomous regulation processes (Eime et al., 2013).

Previous analyses conducted on the same cohort (Sorrentino, Di Martino, Bellacicco e Bellafiore, 2025) showed differences in anxiety levels between students who practiced sport and those who did not. Building upon these findings, the present study adopts a more fine-grained perspective by focusing exclusively on students engaged in extracurricular sport activities.

Rather than examining sport participation as a dichotomous condition, the study investigates two complementary dimensions of sport engagement. The first concerns the number of sports practiced, assuming that participation across multiple disciplines may reflect broader exposure to structured sport experiences and diversified opportunities for social and emotional development. The second concerns the type of sport practiced, based on the assumption that different disciplines may present distinct emotional, cognitive, and relational characteristics.

Accordingly, the study aims to examine whether both the number of sports practiced and participation in specific sport disciplines are associated with school anxiety and mathematics anxiety after controlling for age and gender. By doing so, the study seeks to extend previous findings and provide a more nuanced understanding of how different forms of sport engagement may relate to students' emotional experiences in educational contexts.

Method

The study The study involved 4,221 students attending schools in three Italian regions representing both Northern and Southern Italy: Piedmont, Apulia, and Sicily. Participants completed the Well-Being at School Scale (WE-J) and the Abbreviated Math Anxiety Scale (AMAS). Information regarding participation in extracurricular sport activities was also collected.

Sport participation data were derived from students' reported extracurricular activities and were recoded into dichotomous variables indicating participation (1) or non-participation (0) in each sport discipline. Disciplines with similar characteristics and reduced frequencies were aggregated into

broader categories in order to improve analytical stability. The final sport categories included soccer, tennis/padel, basketball, swimming, martial arts, volleyball, athletics, and dance/gymnastics.

For the present study, analyses focused only on students reporting at least one sport activity. This was ensured by applying a filter that retained only cases with a number of sports practiced greater than zero. Regression analyses were conducted using a complete-case approach; therefore, the final analytical sample varied depending on the outcome and the predictors included in each model.

Data analyses were conducted using JASP. Two sets of multiple linear regression models were estimated separately for school anxiety and mathematics anxiety. In the first model, the number of sports practiced was included as the main predictor together with age and gender. In the second model, sport disciplines were entered simultaneously to estimate their unique associations with anxiety outcomes while controlling for age and gender. Gender was coded as female = 0 and male = 1. Predictors were entered using the Enter method.

Results

School Anxiety

To investigate the relationship between sport participation and school anxiety, two regression models were estimated.

The first model examined whether the number of sports practiced was associated with students' school anxiety levels among those reporting at least one sport activity. The model was statistically significant, $F(3, 1757) = 37.24$, $p < .001$, and explained 6.0% of the variance in school anxiety ($R^2 = .060$). Age emerged as a positive predictor ($\beta = .179$, $p < .001$), indicating higher school anxiety levels among older students. Gender also showed a significant contribution; since gender was coded as female = 0 and male = 1, the negative coefficient indicated that male students reported lower levels of school anxiety than female students. Importantly, the number of sports practiced was negatively associated with school anxiety ($\beta = -.051$, $p = .026$), suggesting that, within the group of students engaged in sport activities, practicing a greater number of sports was associated with slightly lower school anxiety scores.

To further explore whether specific sport disciplines were differentially associated with school anxiety, a second regression model simultaneously included the sport categories while controlling for age and gender. The overall model was statistically significant, $F(10, 1750) = 11.92$, $p < .001$, and explained 6.4% of the variance in school anxiety ($R^2 = .064$).

Age remained positively associated with school anxiety ($\beta = .181$, $p < .001$), confirming the tendency for anxiety levels to increase across the age range considered. Gender also remained significant, with male students reporting lower school anxiety scores than female students.

Among the sport disciplines included in the model, **only tennis/padel** was significantly associated with lower school anxiety ($\beta = -.080$, $p = .001$). No statistically significant associations emerged for soccer, basketball, volleyball, swimming, martial arts, dance/gymnastics, or athletics.

Overall, findings indicate that school anxiety was associated both with the number of sports practiced and, among specific sport disciplines, with tennis/padel participation.

Math Anxiety

The same analytical strategy was applied to mathematics anxiety. The first regression model examined whether the number of sports practiced was associated with mathematics anxiety levels among students reporting at least one sport activity. The model was statistically significant, $F(3, 1756) = 13.47$, $p < .001$, and explained 2.2% of the variance in mathematics anxiety ($R^2 = .022$). Age was positively associated with mathematics anxiety ($\beta = .104$, $p < .001$), indicating higher anxiety levels among older students. Gender also showed a significant contribution; given the coding female = 0 and male = 1, the negative coefficient indicated that male students reported lower mathematics anxiety than female students. However, in contrast to school anxiety, the number of sports practiced was not significantly associated with mathematics anxiety ($\beta = -.037$, $p = .121$).

The second regression model examined whether specific sport disciplines were differentially associated with mathematics anxiety. The overall model was statistically significant, $F(10, 1749) = 5.70$, $p < .001$, and explained 3.2% of the variance in mathematics anxiety ($R^2 = .032$).

Age remained positively associated with mathematics anxiety ($\beta = .106$, $p < .001$), and gender continued to show a significant contribution, again indicating lower mathematics anxiety scores among male students compared with female students.

Among the sport disciplines included in the model, **soccer** ($\beta = -.091$, $p = .025$) and **tennis/padel** ($\beta = -.065$, $p = .010$) were significantly associated with lower mathematics anxiety. No statistically significant associations emerged for basketball, swimming, volleyball, martial arts, dance/gymnastics, or athletics.

Taken together, the results suggest that the number of sports practiced was associated with school anxiety but not with mathematics anxiety, whereas specific sport disciplines, especially tennis/padel and soccer, showed differentiated associations with anxiety outcomes.

Discussion

The present study extends previous evidence on the relationship between sport participation and anxiety by moving beyond the traditional comparison between students who practice sport and those who do not. Focusing specifically on students already engaged in extracurricular sport activities allowed us to investigate whether differences in emotional outcomes may also emerge according to how sport participation is structured and which specific disciplines are practiced. Overall, findings suggest that the relationship between sport participation and anxiety is multidimensional and cannot be reduced to a simple participation/non-participation distinction. At the same time, the results indicate that the associations between sport engagement and anxiety differ depending on the anxiety outcome considered.

A first relevant result concerns the number of sports practiced. Among students reporting at least one sport activity, practicing a greater number of sports was significantly associated with lower school anxiety. This finding suggests that broader engagement in sport activities may be linked to more positive emotional adjustment in school contexts. Participating in multiple sport environments may expose children to a wider range of social interactions, coping opportunities, performance experiences, and contexts requiring adaptation, potentially supporting self-regulatory and emotional competencies.

However, the same pattern did not emerge for mathematics anxiety. Although the model predicting mathematics anxiety was statistically significant, the number of sports practiced was not a significant predictor. This result suggests that mathematics anxiety may be less related to the breadth of sport participation and more closely connected to domain-specific academic experiences, beliefs, and learning histories.

At the same time, the analyses indicate that sport participation should not be interpreted as a homogeneous experience. Once specific sport disciplines were simultaneously considered, different patterns emerged across the two anxiety outcomes.

For school anxiety, tennis/padel was the only sport discipline significantly associated with lower anxiety levels after controlling for age and gender. This finding may reflect the specific characteristics of these activities, which require attentional control, anticipation, self-monitoring, and repeated adaptation to performance situations. These features may be relevant to broader emotional regulation within school contexts.

For mathematics anxiety, soccer and tennis/padel were significantly associated with lower anxiety levels. Soccer involves coordination, cooperation, rapid decision-making, and continuous adaptation to dynamic situations. Tennis and padel, although structurally different from team sports, also require sustained attention, anticipation, and self-regulation. These characteristics may overlap with processes involved in adaptive responses to academic challenges, although the cross-sectional nature of the study prevents causal interpretations.

Another relevant finding concerns age and gender differences. Across analyses, older students tended to report higher levels of both school anxiety and mathematics anxiety. Moreover, male students consistently reported lower anxiety scores compared with female students. Although the present study was not designed to investigate gender mechanisms directly, this pattern is coherent with previous

literature documenting higher self-reported anxiety levels among girls during school age and early adolescence.

Caution is necessary when interpreting the magnitude of these findings. Although the regression models were statistically significant, they explained a relatively limited proportion of variance, particularly for mathematics anxiety. This suggests that sport participation should not be interpreted as a primary determinant of emotional functioning, but rather as one element within a broader network of individual, family, educational, and contextual factors.

Several limitations should be acknowledged. First, the study adopted a cross-sectional and correlational design, preventing causal interpretations. Second, sport participation was operationalized through self-reported categories and did not account for qualitative aspects such as training intensity, competitive level, coaching style, or motivational climate. Third, although aggregating disciplines increased analytical stability, grouping sports into broader categories may have reduced sensitivity to detect finer differences between specific activities.

Despite these limitations, the present findings contribute to extending current knowledge by showing that, among students engaged in extracurricular sport activities, the number of sports practiced and the type of sport practiced show differentiated associations with school-related anxiety outcomes. Future longitudinal and intervention studies should further investigate whether specific characteristics of sport experiences may support anxiety prevention and emotional well-being promotion within school settings.

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Conditioned Half-Pitch 11vs11 Games as Learning Environments for Integrated Technical, Tactical, and Physical Development in U15 Football Players: A Pilot Study

Taleb Manuele

Youth football performance emerges from interacting physical, technical, tactical, perceptual, and decision-making processes, yet training often separates these dimensions. Representative Learning Design proposes preserving the information–movement relationships regulating competitive behaviour (Pinder et al., 2011).

Small-sided and conditioned games can integrate multiple demands, although reducing player numbers may alter positional relations, pressing distances, and collective transitions (Ometto et al., 2018; Sarmento et al., 2018). Conditioned 11vs11 may offer a complementary approach by preserving the full numerical and positional structure while manipulating space and task constraints.

This is relevant for pressing, counter-pressing, high ball recovery, and offensive transition, which are interdependent behaviours. However, evidence remains limited on whether formats preserving the full 11vs11 structure can promote physical, technical, and tactical adaptations observable in competitive match performance.

The aim was to evaluate the effects of a four-week training protocol based on conditioned half-pitch 11vs11 games on external load and technical and tactical performance in U15 football players, and to explore associations between individual changes across domains.

Method

A single-group pre-post quasi-experimental pilot study involved 22 male U15 regional players. The analytical sample comprised 20 outfield players; two goalkeepers participated but were excluded because of position-specific demands. Written guardian consent was obtained.

The four-week protocol was integrated into three weekly 90-min sessions. Each session included two 12-min conditioned 11vs11 bouts on a 50×60 m pitch, separated by 3 min recovery, maintaining a 1-4-3-3 structure. Constraints targeted ball loss, counter-pressing, high recovery, and rapid offensive transition, with recovery within 10 s after possession loss and a shot within 10 s after recovery. A three-touch limit, goalkeeper restarts and scoring incentives were also applied.

Assessment comprised two competitive matches at T0 and two at T1 against same-age opponents of comparable competitive level. Two positionally equivalent XIs ensured that each outfield player completed one full 70-min match at T0 and T1 in the same functional position.

External load was monitored using Catapult One devices with 10-Hz GPS. Matches were fully video-recorded and reviewed through systematic notational analysis. External-load variables were Sprint Distance, Max Acceleration, and Player Load; tactical variables were Successful Pressing Actions and High Ball Recoveries; technical variables were Ball Controls under Pressure and Technical Errors.

Data were analysed in JASP. Paired-samples t-tests with Cohen's d assessed pre-post changes after normality checks; Pearson correlations examined individual change scores. Significance was set at $p<.05$.

Results

All seven outcomes changed significantly (all $p<.001$). Sprint Distance increased from 0.320±0.060 to 0.372±0.069 km, Max Acceleration from 4.558±0.126 to 4.801±0.171 $m \cdot s^{-2}$, Player Load from 430.0±27.3 to 465.6±36.4 AU, Successful Pressing from 5.20±0.77 to 6.95±1.43, High Ball Recoveries from 2.90±0.97 to 3.95±1.47, and Ball Controls under Pressure from 8.25±0.97 to 10.50±1.36; Technical Errors decreased from 8.60±1.14 to 6.55±1.82. Absolute d ranged from 1.00 to 2.38.

ΔSprint Distance correlated with ΔPressing (r=.492,p=.028), ΔHigh Recoveries (r=.731,p<.001), ΔControls (r=.526,p=.017), and ΔErrors (r=−.605,p=.005).
ΔMax Acceleration correlated with ΔPressing (r=.451,p=.046), ΔHigh Recoveries (r=.755,p<.001), and ΔErrors (r=−.453,p=.045), but not ΔControls (r=.434,p=.056).
ΔPlayer Load correlated with ΔHigh Recoveries (r=.695,p<.001), ΔControls (r=.502,p=.024), and ΔErrors (r=−.541,p=.014), but not ΔPressing (r=.430,p=.058).

Discussion

Conditioned half-pitch 11vs11 may support integrated development by preserving numerical and positional structure while increasing spatial density and temporal pressure. Competitive-match assessment suggests potential transfer beyond training.

However, the small sample, single-group design, absence of a control group, and specific competitive context limit causal inference and generalizability.

Future studies should use larger samples, longer exposure, experimental-control designs, and examine different ages, sexes, categories, academy levels, tactical formations, and playing structures. Randomization and follow-up assessments should be considered where feasible.

Conditioned half-pitch 11vs11 may represent a representative strategy for integrating physical, technical, and tactical development in youth football. The pre-post changes and cross-domain associations support the multidimensional nature of the training protocol and suggest potential transfer to competitive performance. Given the pilot design, findings remain preliminary and require confirmation in controlled studies.

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Passive drag in paralympic swimmers: new insights

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In Paralympic swimming, the current functional classification system aims to minimize the influence of impairment on performance outcomes (Payton et al., 2020; Hogarth et al., 2021). However, classification still relies mainly on clinical assessment and qualitative in-water observation, while objective biomechanical measures are only marginally considered (Burkett et al, 2018; Oh et al., 2013). Passive drag, defined as the hydrodynamic resistance experienced by a swimmer maintaining a fixed streamlined position, can be objectively measured through towing procedures and represents a promising candidate for evidence-based athlete evaluation (Scurati et al., 2019). Despite its potential, no standardized protocol is currently available for deriving a practical passive drag index for Paralympic swimmers.

The aims of this study were: (i) to develop and validate a simple methodology for estimating a passive drag index (KD) representative of Paralympic swimming, and (ii) to compare passive drag under different towing conditions.

Methods

Eleven elite Paralympic swimmers (sport classes S3 to S9) participated in the study. Passive drag was measured using the Spektro Swim towing system at four constant towing velocities (1.1, 1.5, 1.9, and 2.3 $m \cdot s^{-1}$). Measurements were collected in four experimental conditions obtained by combining two body positions (prone and supine) with two swimsuit types (training and racing).

Passive drag values were normalized by body mass and modeled using a quadratic relationship between drag and velocity. A velocity-independent passive drag index (KD) was estimated through linear regression constrained to pass through the origin. Model performance was evaluated using the uncentered coefficient of determination (R^2), Absolute Percentage Error (APE), and the coefficient of variation (CV) of the measured KD across towing speeds. A leave-one-speed-out sensitivity analysis was performed to assess whether all four towing velocities were necessary for reliable estimation. Finally, estimated KD was compared across experimental conditions using a two-way repeated-measures ANOVA (body position × swimsuit).

Results

The quadratic model accurately described the relationship between passive drag and towing velocity, with an overall uncentered R^2 of 0.992, indicating excellent agreement between measured and predicted values. Prediction accuracy improved progressively as towing velocity increased: mean APE decreased from 15.7% at 1.1 $m \cdot s^{-1}$ to 4.8% at 2.3 $m \cdot s^{-1}$, while the variability of the measured KD remained relatively stable (CV ≈ 9–10%), suggesting that the higher prediction error at low speed reflected model limitations rather than measurement instability.

The leave-one-speed-out analysis demonstrated that the KD estimate was highly robust. Excluding the lowest towing speed slightly improved prediction accuracy (from R2 0.993 to 0.994) and reduced variability (from 8.6 % to 10.5 %), whereas removing the highest speed produced the largest estimation bias (6.5 %) despite little change in overall model fit. These findings indicate that high towing velocities contribute substantially to accurate KD estimation.

Repeated-measures ANOVA revealed a significant main effect of body position ($p = 0.007$), with passive drag approximately 18–23% higher in the supine than in the prone position (wearing training and racing swimsuits, respectively). No significant effect of swimsuit type ($p = 0.154$) or position × swimsuit interaction was observed.

Discussion

The proposed estimated KD provides a robust, velocity-independent descriptor of passive drag in Paralympic swimmers. Summarizing the entire drag–velocity relationship into a single parameter facilitates comparisons across athletes and experimental conditions while reducing dependence on individual towing speeds.

Although excluding the lowest towing velocity could simplify the protocol and slightly improve prediction accuracy, this modification may not be advisable in Paralympic swimming. Athletes with more severe impairments may be unable to tolerate higher towing speeds, making the inclusion of 1.1 $m \cdot s^{-1}$ important for ensuring protocol feasibility across the full spectrum of functional abilities.

The observed positional effect confirms that body orientation is the primary determinant of passive drag in this population. Conversely, the absence of a significant swimsuit effect differs from findings reported in able-bodied swimmers. This discrepancy could likely be explained by the marked heterogeneity of impairment characteristics within the sample. Individual responses frequently showed opposite trends, suggesting that impairment-specific posture and trunk control may influence passive drag more strongly than swimsuit technology.

These findings also indicate that passive drag characteristics in Paralympic swimmers cannot yet be assumed to mirror those reported for able-bodied athletes, underscoring the need for further investigation in larger, functionally stratified samples.

Conclusions

Beyond validating a practical methodology, this study provides several new insights into passive drag in Paralympic swimming. First, it demonstrates that a single velocity-independent parameter (estimated KD) can reliably summarize passive drag across multiple towing velocities. Second, it shows that body position is the main determinant of passive drag, whereas racing swimsuits have only a limited overall effect in this heterogeneous population. Finally, the findings suggest that protocol optimization should consider not only statistical performance but also the functional limitations of Para swimmers, highlighting that methodological choices cannot simply be transferred from able-bodied swimming. These observations represent an important step toward objective athlete assessment and future evidence-based functional classification.

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Effects of biological maturation on match running performance in young soccer players: a preliminary study

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Biological maturation is recognized as a key determinant of physical development and performance in youth soccer players (Jager et al., 2025). Since players of the same chronological age may differ substantially in their biological maturity, assessing maturation is essential to support talent identification and long-term player development. Although skeletal age is considered the reference method, non-invasive approaches such as maturity offset (MO) have become widely adopted because they provide a practical estimate of biological maturation (Mirwald et al., 2002). While the influence of biological maturation has been extensively investigated in physical performance tests and small-sided games, its effects on external load during official match play remain unclear, particularly in sub-elite youth soccer players (Jager et al., 2025). Therefore, the present study aimed to investigate the influence of biological maturation, playing position, and positional zone on match-running performance in U-14/U-15 sub-elite soccer players.

Methodology

Thirty-two sub-elite male soccer players (U-14/U-15) from an Italian regional academy participated in the study. Twenty official matches (10 per age group) played during the final phase of the 2025–2026 season were monitored. Only observations in which players completed at least 35 min of a half were included. Biological maturation was estimated using the Mirwald maturity offset (MO) equation based on anthropometric measurements. Players were classified according to playing position (defender, midfielder, or strikers) and positional zone (central or lateral). External load was monitored using 18.18 Hz GPS devices (GPEXE®, Exelio, Italy) (Hoppe et al., 2018). Total distance (TD), peak velocity (Vpeak), high-speed running (HSR; 13–18 $km \cdot h^{-1}$), sprint distance (SD; >18 $km \cdot h^{-1}$), accelerations (>2.5 m·s-2), decelerations (<-2.5 m·s-2), and high metabolic load distance (HMLD) were collected and normalized to playing time. Linear mixed models (LMM) were used to examine the association between MO and match-running performance. Three models were developed by progressively including playing position and pitch zone as fixed effects, while player identity was included as a random intercept.

Results

No significant associations between maturity status and TD, HSR, accelerations, or decelerations were observed (all $p > 0.05$). Conversely, maturity status was positively associated with Vpeak ($\beta = 1.233$, $p < 0.001$), sprint distance ($\beta = 1.127$, $p = 0.011$), and HMLD ($\beta = 1.019$, $p = 0.050$). Playing position significantly influenced TD, HSR, sprint distance, accelerations, decelerations, and HMLD, with defenders consistently exhibiting lower values than strikers (all $p < 0.05$), whereas no significant differences were observed between midfielders and strikers. Regarding pitch zone, lateral players demonstrated greater HSR ($\beta = 2.388$, $p = 0.043$), sprint distance ($\beta = 2.358$, $p = 0.006$), and HMLD ($\beta = 2.829$, $p = 0.005$) than central players, while no significant effects were found for TD, Vpeak, accelerations, or decelerations (all $p > 0.05$).

Discussion

The present study investigated the influence of biological maturation and playing position on match-running performance in sub-elite U-14/U-15 soccer players. Maturity offset was positively associated with Vpeak, sprint distance, and HMLD, supporting previous evidence that biological maturation is an important determinant of high-intensity locomotor performance during adolescence (Schubert et

al., 2026). These findings may be explained by maturity-related improvements in stride mechanics, neuromuscular function, and intermittent exercise capacity, enabling more mature players to perform high-intensity actions more effectively (Schubert et al., 2026). In contrast, no significant associations were observed for TD, HSR, accelerations, or decelerations, suggesting that these metrics are more strongly influenced by technical, tactical, and contextual factors than biological maturation alone. Similar inconsistencies have been reported in previous studies, particularly across different age categories (Parr et al., 2022; Ribeiro et al., 2026). Besides biological maturation, playing position was another key factor influencing match-running performance. Defenders exhibited lower locomotor demands than strikers, whereas lateral players performed greater HSR, sprint distance, and HMLD than central players. These findings are consistent with previous research and likely reflect the tactical responsibilities associated with each position. Indeed, strikers and wide players are more frequently involved in one-versus-one situations, and offensive transitions, whereas central players generally operate in more congested areas of the pitch (Parr et al., 2022). From a practical perspective, coaches should consider biological maturation together with playing position and positional zone when interpreting match-running performance.

Conclusions

The present findings demonstrate that biological maturation primarily influences high-intensity locomotor actions, as well as playing position and positional zone contribute to match-running demands. Integrating biological and positional characteristics may improve the interpretation of external load and support individualized player development in sub-elite youth soccer.

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