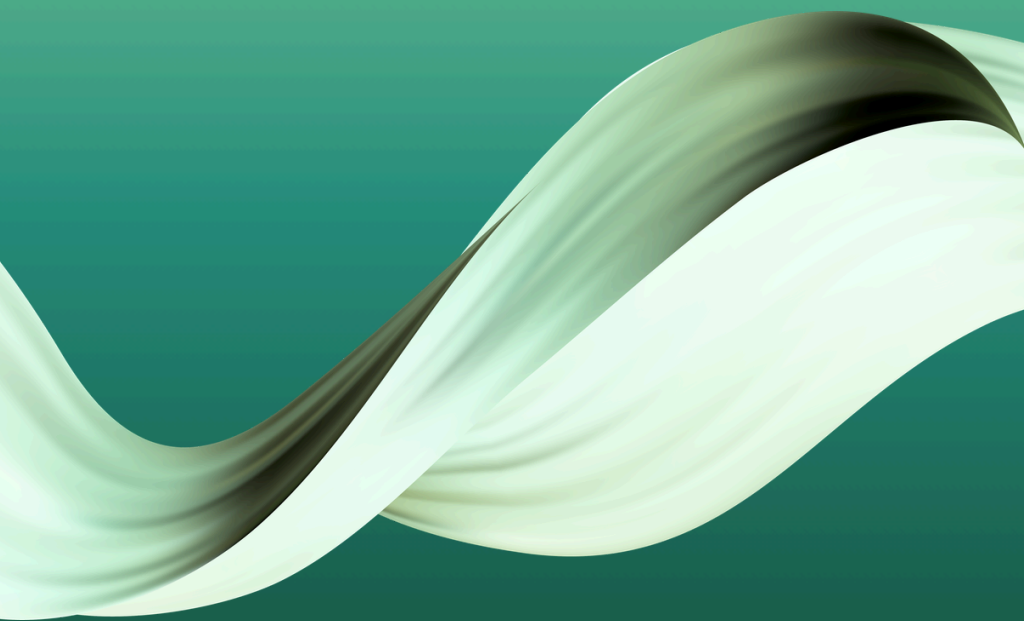




ALGORITHMIC HEARTBEATS

*Affective Education in the Age
of the Fourth Revolution*



Edited by

FRANCESCO PELUSO CASSESE

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Managing Editor: Luna Lembo

Printed: October 2026

ISBN: 979-12-82860-00-0

DOI 10.5281/zenodo.23211263

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edited by Francesco Peluso Cassese

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The REN Conference book series was established as a dedicated forum for reflection, research, and interdisciplinary dialogue in the fields of educational sciences, educational neuroscience, and the emerging frontiers of learning in the age of digital transformation. Building directly on the experience and scholarly debate developed within the REN International Conference, a key event in the field of educational and pedagogical research, the series aims to bring together and systematize the contributions of national and international scholars, researchers, and education professionals. The volumes published within the series explore the complexity of contemporary educational processes, focusing on several key areas: Educational Neuroscience and Learning: the analysis of the neurobiological mechanisms underlying knowledge and learning, inclusion, embodiment, and executive functions, and their application to educational contexts Inclusion and Special Education: models, practices, and methodologies grounded in Universal Design for Learning (UDL), universal accessibility, and the removal of barriers to learning; Digital Humanism and Emerging Technologies: the impact of artificial intelligence, virtual environments, augmented reality, and affective-relational dimensions in addressing the challenges posed by the Fourth Industrial Revolution; Teaching Innovation and Educational Models: evidence-based methodological approaches and empirical experiences aimed at renewing teaching and learning processes across schools, universities, and continuing education. To ensure high scientific standards, independence, and epistemological rigour, editorial proposals and scholarly contributions included in the volumes of the series undergo a double-blind peer-review process, overseen by the REN Conference Scientific Committee and external reviewers with recognised expertise in the relevant fields. The series is intended for academics, researchers, educators, pedagogical professionals, teachers, and practitioners working across school and university contexts, providing a rigorous resource for keeping abreast of scientific developments and fostering critical reflection.

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.

Topic 7

Kinesiology and sport between education and
performance in European area

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. Parallely, 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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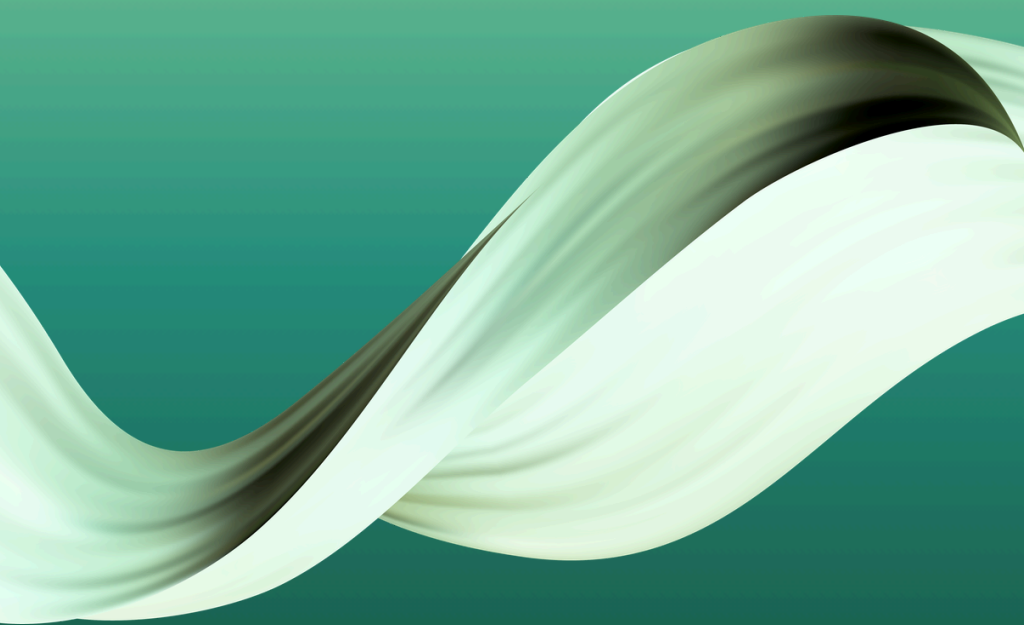
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ISBN: 979-12-82860-00-0



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