Journal of Inclusive Methodology and Technology in Learning and Teaching
ISSN 2785-5104
Anno 6 n. 4 (2026)

EDIZIONI UNIVERSITARIE ROMANE
editoria scientifica dal 1952

From Technology-Mediated Interaction to Social Participation: Engagement, Transfer, and Digital Affective Literacy

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Abstract: Social robots, affective computing systems, and immersive environments are used in educational interventions for students with autism spectrum disorder (ASD), and the engagement they elicit is among the most frequently reported outcomes. This theoretical paper asks under what conditions such engagement constitutes an educational outcome rather than remaining confined to the technological setting. Drawing on research on engagement, socially assistive robotics, and the generalization of social skills in ASD, it distinguishes technology-directed from technology-supported engagement. It adopts transfer as the criterion of educational relevance and separates a proximal level, observed during the interaction, from two levels of transfer, near and far. The empirical studies examined document the proximal level, whereas transfer to relationships with adults and peers appears as a stated goal rather than as a measured outcome. The paper argues that this shift requires teacher mediation and describes the competence it calls for through the construct of *Digital Affective Literacy*, articulated in three components: observation, interpretation, and design. The construct is a theoretical proposal that requires operational definition and empirical validation.

Keywords: technology-mediated engagement; socio-emotional skills transfer; Digital Affective Literacy; autism spectrum disorder; socially assistive robotics

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1. Introduction

Social robots, emotion recognition systems, augmented reality, and virtual environments are used in interventions for students with autism spectrum disorder (ASD). These technologies make it possible to create predictable, gradable, and customizable situations in which the complexity of social stimuli can be modulated according to individual needs. They have been employed to support joint attention, imitation, emotion recognition, and communication skills in students who find it difficult to interpret implicit interpersonal cues.

The engagement displayed during these activities is among the most frequently reported outcomes: students may show greater attention, persistence, and willingness to interact with the device. On their own, however, these behaviors do not establish whether the experience has produced a competence that can be used outside the technological setting. The question guiding this paper is therefore under what conditions technology-generated engagement constitutes an educational outcome. Our hypothesis is that it does so when it fosters forms of participation

that extend to relationships with adults and peers, through the transfer of competence to less structured situations.

The paper is theoretical in nature: it examines studies selected for their relevance to the research question, without the procedures of a systematic review, and compares them according to criteria stated in each section. On this basis, it proposes the construct of *Digital Affective Literacy*, which describes the competence teachers need to support the shift from interaction with technology to social participation. The construct is the authors' theoretical proposal and still needs to be operationally defined and validated.

The argument unfolds in four steps:

- Section 2 examines what engagement signals allow us to establish;
- Section 3 explains why a competence practiced with an artificial agent does not carry over by itself to relationships with people;
- Section 4 adopts transfer as the criterion of educational relevance, distinguishes its levels, and examines what the studies document and which conditions foster transfer;
- Section 5 defines Digital Affective Literacy as a design competence of the teacher.

2. Engagement and Technology-Mediated Interaction

2.1. A Multidimensional Construct

In the literature, engagement is described as a multidimensional construct comprising a behavioral, an emotional, and a cognitive component. Fredricks et al. (2004) reviewed research on school engagement and proposed considering it "a 'meta' construct" (p. 60), that is, a construct that brings the three components together; they also observed that, in the individual student, these components are dynamically interrelated. Distinguishing between the components makes it possible to separate observable participation from actual investment in the learning experience. In technology-mediated environments, this distinction carries greater weight. Attention, persistence, and correct task execution are behavioral indicators. On their own, they are not sufficient to establish emotional and cognitive engagement, nor do they indicate whether the competence practiced will be used in other contexts. Moreover, the student interacts with a system that, in some cases, responds to their behavior, so the engagement observed is also a response to the system.

2.2. Responsive Technologies

Two families of technologies make this responsiveness explicit. The first is socially assistive robotics, in which the robot interacts with the child to support the development of social and communication skills. The second is affective computing, a term that goes back to the work of Picard (1997). Affective computing refers to the set of techniques through which an artificial system recognizes users' affective

states from observable signals (Poria et al., 2017).[1] The most widely studied signals are visual (facial expressions, gestures), acoustic (voice), and textual.

The responsiveness of these systems can serve a scaffolding function, that is, the support through which a tutor enables learners to carry out a task they would be unable to complete on their own (Wood et al., 1976). It can be hypothesized that, for students with ASD, an artificial agent with regular behaviors and a controlled communicative repertoire reduces the ambiguity of the exchange and facilitates access to social information.

The studies need to be examined with two factors in mind: the population, since not all of them involve children with autism, and the duration of observation. Rudovic et al. (2018) developed personalized machine learning models to estimate the affect and engagement of 35 children with autism during a robot-assisted therapy session.[2] The personalized models outperformed non-personalized ones and reached an average agreement of around 60% with the ratings of human experts. The authors present this result as an improvement and justify personalization on the premise that many individuals with autism express their affective states in atypical and highly heterogeneous ways. We draw an implication that the authors do not emphasize: even when personalized, automatic estimation agrees only partially with the judgment of expert observers.

As regards duration, Ahmad et al. (2019) followed 24 primary school children, who met the robot in four sessions over two weeks. The robot kept a memory of each child's emotional events and adapted its behavior accordingly; the authors report, as a preliminary finding, that this behavior sustained social engagement across sessions. The study does not specifically target children with autism: it documents the persistence of engagement among primary school children. Duration is taken up again in Section 4.3, and the population issue among the limitations of this paper (Section 6).

2.3. What Engagement Signals Measure

From a measurement perspective, the signals recorded by a system are not a direct representation of subjective experience. They depend on probabilistic models, predefined categories, and training data. Estimates based on these signals must also contend with the expressive variability of individuals with autism (Section 2.2). From a pedagogical perspective, a positive response to technology can carry different meanings. Increased attention may stem from the novelty of the device. Sustained participation in the activity may reflect the rigidity of its structure or an interest that remains tied to the device. Correct execution of an instruction may indicate compliance rather than understanding. Finally, stimulus intensity that is

[1] The sources on affective computing and social robotics cited in this paper (Esteban et al., 2017; Kumazaki et al., 2017; Picard, 1997; Poria et al., 2017; Rudovic et al., 2018; Short et al., 2017) come from computer science, engineering, and psychiatry; the connection with the educational context is the authors' own.

[2] Machine learning refers to the set of methods by which a system derives, from examples, a rule for classifying new data; a personalized model is also trained on data from the individual child. Agreement with the experts is measured using the intraclass correlation coefficient (ICC), an index of inter-rater agreement.

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excessive for the student may produce sensory overload even when attention appears high.

Kory Westlund et al. (2017) conducted an experiment with 45 children aged 4 to 7 years, without reporting their developmental status. A robot told the same story with either an expressive or a flat voice. In the expressive condition, children appeared more concentrated and engaged, as judged from their facial expressions, and four to six weeks later they retold the story more extensively. Learning of the target words, by contrast, was similar across the two conditions. We infer that the relationship between engagement and learning must be verified outcome by outcome: greater engagement was accompanied by an advantage on some outcomes but not on others.

Engagement should therefore be interpreted in relation to the outcome of interest and to its consequences in subsequent contexts, not only through quantitative indicators such as interaction time. This leads to a distinction that Section 4.2 develops further. *Technology-directed engagement* is engagement that remains focused on the device. *Technology-supported engagement* is engagement in which technology becomes a support for developing competences that can be used in other situations. The characteristics of the tool affect the amount of engagement. Our hypothesis is that it is educational design that determines whether this engagement remains directed at the device or becomes technology-supported.

3. From Simplified Signals to Human Relationships

This section examines what distinguishes the signals offered by an artificial agent from those of human relationships, drawing on the debate on mirror neurons in ASD and on the way actions and emotions manifest themselves in relationships.

3.1. The Mirror Neuron Debate in ASD

The mirror neuron system is a set of cortical areas that become active both when individuals perform an action and when they observe the same action performed by others. This system has been proposed as one of the mechanisms underlying imitation and the understanding of others (Rizzolatti & Sinigaglia, 2006). The broken mirror hypothesis attributes the difficulties in imitation and emotion understanding observed in ASD to reduced functioning of this system (Ramachandran & Oberman, 2006). In a systematic review, Hamilton (2013) examined 25 studies using different techniques, including functional magnetic resonance imaging (fMRI), which records changes in brain activity during a task. She concludes that there is little evidence of a global dysfunction of the system and considers the data consistent with the STORM model ("social top-down response modulation," p. 101), according to which what is altered in autism is the control of imitative responses as a function of social cues, rather than the system itself. By contrast, the meta-analysis by Chan and Han (2020) of 20 fMRI studies on action observation in adolescents and adults found hyperactivation in some areas of the system, which the authors interpret as an alteration. The two syntheses nonetheless agree on one point: differences between individuals with ASD and control groups depend on the type of stimulus. According to Hamilton (2013), such differences emerge in fMRI studies with emotional stimuli but not with simple hand actions; Chan and Han (2020) also point to age as a moderating factor.

The debate thus advises against attributing social and imitative difficulties to a single neurobiological cause. Educational implications are well founded when they rest on observed behavior, and it is at this level that the teacher's interpretation operates (Section 5.1).

3.2. Vitality Forms and Simplified Signals

Stern (2010) uses the term *forms of vitality* for the dynamic qualities with which an action is performed, such as the force and temporal contour of a movement. Vitality forms concern the "how" of an action rather than its content, and they allow observers to grasp the internal state of the agent. Di Cesare et al. (2014) conducted an fMRI study comparing the recognition of the "how" and the "what" of an observed action; they found activation of the right dorso-central insula, which they tentatively associate with the understanding of vitality forms.

These studies yield an insight relevant to transfer, although their authors do not address it. Even when it adapts its behavior to the child, a social robot selects its expressions from a predefined repertoire of discrete, coded signals. In human relationships, by contrast, actions and emotional expressions unfold through continuous and nuanced vitality forms that vary from one interlocutor to another. The very simplification that makes the artificial agent accessible is what separates it from the contexts in which the competence will have to be used. Recognizing an emotion displayed by a robot and recognizing it on a classmate's face are therefore different tasks, and the transition from one to the other must be designed.

4. Transfer as a Criterion of Educational Relevance

4.1. Transfer and Generalization

In this paper, transfer refers to the use of a competence in a context different from the one in which it was learned. Generalization is its observable manifestation: it denotes the stability of the competence across changes in interlocutors, spaces, activities, and degree of structure. The distinction clarifies what studies can document: transfer is operationally assessed through the generalization of the competence to interlocutors and situations other than those of the learning phase. Throughout the paper, "setting" denotes the situation of the intervention and "context" the situation in which the competence is used. In interventions for ASD, verifying generalization is also necessary because, as Raulston and Hansen (2022) point out, children with autism often have difficulty generalizing social skills across different environments and contexts.

Pennazio (2019) conducted a critical review of 35 studies on the use of robotics for social skills in autism, involving children aged 4 to 12. She formulates the criterion by which such interventions should be judged as follows: "Learning achieved in a purpose-built situation and with a robotic mediator is not meaningful in itself; it becomes meaningful only if it can subsequently be replicated in a real context with human interlocutors" (p. 3, our translation). This is the criterion adopted in this paper. Kumazaki et al. (2017) and Esteban et al. (2017) likewise identify the transfer of skills learned in sessions to interactions with people as a goal of robot-assisted therapy. Section 4.3 examines the extent to which this goal is documented.

4.2. From Interaction to Transfer: Three Levels

To describe the relationship between engagement and transfer, we distinguish three levels, which are used below as an analytical criterion. The first is the starting point; the other two are degrees of transfer:

- the *proximal* level concerns the responses observed during interaction with the technology: attention, orientation toward the stimulus, reciprocity, imitation, emotional expression, and persistence in the activity;
- the *near* level concerns the reuse of the competence in guided situations with an adult or with peers, in which the device may remain a support without being the sole interlocutor;
- the *far* level concerns the use of the competence in natural and not entirely predictable contexts, such as the classroom, recess, cooperative work, free play, and the family.

At the proximal level, technology-directed and technology-supported engagement cannot be told apart, because both manifest themselves in interaction with the device. The latter becomes recognizable at the subsequent levels, when the competence practiced with the device reappears with other interlocutors. At the near level, the activity may take on a triadic configuration involving the student, the device, and an adult or a peer: an emotion identified with the robot can be discussed with a classmate. In an exploratory study with children with autism, Short et al. (2017) point to the inclusion of human partners in triadic interactions as a way to foster social skills. At the far level, the student must recognize the less explicit vitality forms of human relationships (Section 3.2). Here engagement acquires inclusive relevance, because it translates into active presence and relational initiative.

Accordingly, we propose distinguishing between two notions of effectiveness. Proximal effectiveness is the effectiveness documented during sessions, at the first level. Ecological effectiveness is the effectiveness documented in school and everyday life, at the far level, with the near level acting as a bridge between the two. An intervention may achieve the former without the latter. Table 1 summarizes the three levels; the last column anticipates the components of Digital Affective Literacy (Section 5).

Table 1. Proximal level and levels of transfer: observable indicators, function of technology, and teacher action.

Level	What Is Observed	Function of Technology	Teacher Action
Proximal	Attention, orientation, reciprocity, imitation, emotional expression, and persistence during interaction with the device	Main interlocutor: makes exchanges predictable and gradable	Observing engagement and interpreting its meaning (Section 2.3)
Near	Reuse of the competence in guided activities with an adult or with peers	Non-exclusive support and connecting point in triadic activities	Linking the experience with the device to shared experiences; varying interlocutors

Level	What Is Observed	Function of Technology	Teacher Action
Far	Spontaneous use of the competence in the classroom, in free play, in cooperative work, and in the family	In the background or absent	Setting up less structured contexts, gradually fading supports, observing across different times and spaces

Note. Developed by the authors.

4.3. What the Studies Document

We now consider the level at which the evidence examined is located, comparing the studies by setting and by duration of observation. The empirical studies discussed in Section 2.2 take place in clinical settings or experimental sessions, even when they are conducted at school. They observe children in a single session (Rudovic et al., 2018) or in a few closely spaced sessions (Ahmad et al., 2019). Kory Westlund et al. (2017) measure an outcome several weeks later, but one that concerns the same story told by the robot. In all these studies, the competence is observed within the experimental sessions.

The reviews examined indicate that this situation is not limited to these studies. In her review of 35 robotics studies with children with autism, Pennazio (2019) notes that few studies address transfer to human interlocutors. Vivanet (2014), in a review of the evidence on educational technologies for ASD, states that the generalization to everyday life of gains obtained in mixed reality remains to be verified. Short et al. (2017) acknowledge that their study design does not allow pre–post intervention comparisons. A consequence follows that these authors do not draw: the behaviors elicited by the robot, however rich, are not in themselves evidence of generalization. In the works examined, therefore, transfer at the near and far levels appears as a stated goal (Esteban et al., 2017; Kumazaki et al., 2017) and as a gap identified by reviews, not as a measured outcome.

4.4. Conditions for Transfer

Since transfer is not automatic, which conditions foster it? With regard to instructional strategies, Raulston and Hansen (2022) describe five strategies for promoting the generalization of social skills of children with autism to inclusive play settings: social narratives, visual supports, environmental arrangement, prompting, and praise. With regard to continuity across contexts, Zappalà (2021) argues for the need to integrate the use of technologies across all the life contexts of students with ASD—formal, non-formal, and informal—and links educational continuity to the process of generalization.

With regard to mediation, Vivanet (2014) reports that, according to a meta-analysis (Grynszpan et al., 2014, as cited in Vivanet, 2014), longer technology-based interventions were less effective, a counterintuitive finding that, in the meta-analysis authors' own view, warrants further investigation. As a possible explanation, Vivanet (2014) notes that in the longer interventions the pre-experimental training was not conducted by a specialist but by the individual with ASD independently, by parents at home, or by the teacher at school. In the meta-analysis, then, longer duration coincides with the absence of a specialist, and the data do not allow the two factors to be disentangled. Building on this explanation, we suggest that effectiveness may

depend more on who guides the activity than on the amount of exposure to the device. This hypothesis bears directly on teacher education, since the cases without a specialist include those in which the teacher led the training at school.

The sources discussed and the levels outlined in Section 4.2 can be brought together in the following conditions, which constitute the authors' proposal:

- progressively varying interlocutors, from the device to adults and peers;
- introducing less structured tasks that are closer to everyday school life and involve classmates;
- gradually fading supports, both technological and non-technological;
- attending to environmental arrangement, one of the strategies identified by Raulston and Hansen (2022);
- observing the competence at different times and in different spaces, and verifying its maintenance over time.

In sum, transfer is not documented in the empirical studies examined; moreover, it requires purposefully designed conditions in which the teacher plays a central role.

5. Digital Affective Literacy as a Design Competence

5.1. Definition and Components

The ability of a technology to detect affective signals does not replace pedagogical interpretation, because the data produced by the system must be interpreted in light of the student's history, the context, and the goals of the intervention. *Digital Affective Literacy* is the teacher's ability to observe the affective signals that emerge in the interaction between student, technology, and environment, to interpret them, and to use them to design the transfer of competence from the intervention setting to other contexts. It presupposes teachers' digital competence but differs from it in the centrality it assigns to the affective dimension of interaction. It links this dimension to educational observation, knowledge of functioning profiles, and instructional design.

The construct comprises three components, which respond to the problems identified in the previous sections:

- *observation*, that is, the ability to detect changes in attention, emotional expression, willingness to interact, and behavioral regulation;
- *interpretation*, that is, the ability to attribute to these signals one of the meanings distinguished in Section 2.3 (novelty of the device, rigidity of the structure, device-bound interest, compliance, sensory overload) or, alternatively, genuine understanding;
- *design*, that is, the ability to set up the conditions outlined in Section 4.4, in which the competences practiced with technology are taken up again with adults and peers in progressively less structured contexts.

Observation integrates automatic estimates, which agree only partially with the judgment of expert observers (Section 2.2), with what the teacher knows about the student's history and the situation. Interpretation is grounded in observed behavior, without reducing a student's difficulties to a single neurobiological explanation (Section 3.1).

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Design also concerns the environment. It can be hypothesized that, for students with ASD, the predictability and structuring of space support behavioral regulation. Among the elements of a competent use of school space, Cleveland and Mahat (2026) include quiet areas for reflection and emotional regulation, accessible layouts, and zones for hands-on and collaborative activities. For Digital Affective Literacy, this suggests designing physical and digital environments that support diverse needs, without confining specialized resources to areas separated from ordinary school life.

5.2. Digital Affective Literacy and Teacher Education

Technical mastery of devices is a prerequisite for Digital Affective Literacy, not one of its components. The components themselves can be cultivated in initial teacher education. Frei-Landau et al. (2023) used a qualitative approach to examine a digital neuroscience course attended by 193 pre-service teachers, most of them in special education. The authors identify four learning outcomes: understanding of the brain mechanisms underlying neurodevelopmental disorders, greater empathy toward children with these disorders, a broader conception of the teacher's professional role, and the ability to design pedagogical adaptations. We derive an implication for initial teacher education: knowledge about neurodevelopment can be taught together with the design of adaptations, which corresponds to the third component of Digital Affective Literacy.

6. Conclusions

This paper asked under what conditions technology-generated engagement constitutes an educational outcome for students with ASD. The analysis yields five findings:

- engagement is a relevant but insufficient indicator, and at the proximal level it does not distinguish technology-directed from technology-supported engagement (Sections 2 and 4.2);
- the coded signals of an artificial agent differ from those of human relationships, and transfer is not automatic (Section 3);
- the empirical studies examined document the proximal level, whereas the near and far levels appear as goals (Section 4.3);
- moving to the levels of transfer requires conditions that, in the proposal advanced here, it is the teacher's task to design (Section 4.4);
- Digital Affective Literacy describes the competence that these conditions require (Section 5).

Technology can facilitate access to interaction and offer protected learning situations; it is up to educational design to build the connections with ordinary contexts.

This paper has limitations that should be acknowledged. The studies were selected for relevance, without the procedures of a systematic review, and other studies may document transfer. The empirical studies on robot-based interventions have small samples, are conducted in clinical or experimental settings, and involve preschool and school-age children; two of them (Ahmad et al., 2019; Kory Westlund et al., 2017) do not specifically target children with autism. Finally, Digital Affective

Literacy is a theoretical proposal that systematizes insights already present in the literature and has yet to be operationally defined and empirically validated.

Two lines of research follow from this. The first is a scoping review on the transfer of socio-emotional skills in technology-mediated contexts, using the three levels as a classification criterion. The second is the operational definition and validation of Digital Affective Literacy, with observable indicators for each component, through longitudinal studies in school contexts that examine the maintenance of competences and their generalization.

References

Ahmad, M. I., Mubin, O., Shahid, S., & Orlando, J. (2019). Robot's adaptive emotional feedback sustains children's social engagement and promotes their vocabulary learning: A long-term child–robot interaction study. *Adaptive Behavior, 27*(4), 243–266. https://doi.org/10.1177/1059712319844182

Chan, M. M. Y., & Han, Y. M. Y. (2020). Differential mirror neuron system (MNS) activation during action observation with and without social-emotional components in autism: A meta-analysis of neuroimaging studies. *Molecular Autism, 11*, Article 72. https://doi.org/10.1186/s13229-020-00374-x

Cleveland, B., & Mahat, M. (2026). Learning spaces in schools: A pedagogic research agenda. *Pedagogies: An International Journal, 21*(1), 137–149. https://doi.org/10.1080/1554480X.2025.2609436

Di Cesare, G., Di Dio, C., Rochat, M. J., Sinigaglia, C., Bruschweiler-Stern, N., Stern, D. N., & Rizzolatti, G. (2014). The neural correlates of 'vitality form' recognition: An fMRI study. *Social Cognitive and Affective Neuroscience, 9*(7), 951–960. https://doi.org/10.1093/scan/nst068

Esteban, P. G., Baxter, P., Belpaeme, T., Billing, E., Cai, H., Cao, H.-L., Coeckelbergh, M., Costescu, C., David, D., De Beir, A., Fang, Y., Ju, Z., Kennedy, J., Liu, H., Mazel, A., Pandey, A., Richardson, K., Senft, E., Thill, S., … Ziemke, T. (2017). How to build a supervised autonomous system for robot-enhanced therapy for children with autism spectrum disorder. *Paladyn, Journal of Behavioral Robotics, 8*(1), 18–38. https://doi.org/10.1515/pjbr-2017-0002

Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School engagement: Potential of the concept, state of the evidence. *Review of Educational Research, 74*(1), 59–109. https://doi.org/10.3102/00346543074001059

Frei-Landau, R., Grobgeld, E., & Guberman, R. (2023). Implementing digital neuroscience in special-needs-teacher education: Exploring student-teachers' multifaceted learning outcomes related to teaching children with neurodevelopmental disorders. *Frontiers in Psychology, 14*, Article 1232315. https://doi.org/10.3389/fpsyg.2023.1232315

Hamilton, A. F. de C. (2013). Reflecting on the mirror neuron system in autism: A systematic review of current theories. *Developmental Cognitive Neuroscience, 3*, 91–105. https://doi.org/10.1016/j.dcn.2012.09.008

Kory Westlund, J. M., Jeong, S., Park, H. W., Ronfard, S., Adhikari, A., Harris, P. L., DeSteno, D., & Breazeal, C. L. (2017). Flat vs. expressive storytelling: Young children's learning and retention of a social robot's narrative. *Frontiers in Human Neuroscience, 11*, Article 295. https://doi.org/10.3389/fnhum.2017.00295

Kumazaki, H., Warren, Z., Muramatsu, T., Yoshikawa, Y., Matsumoto, Y., Miyao, M., Nakano, M., Mizushima, S., Wakita, Y., Ishiguro, H., Mimura, M., Minabe, Y., & Kikuchi, M. (2017). A pilot study for robot appearance preferences among high-functioning individuals with autism spectrum disorder: Implications

for therapeutic use. *PLOS ONE, 12*(10), Article e0186581. https://doi.org/10.1371/journal.pone.0186581

Pennazio, V. (2019). Robotica e sviluppo delle abilità sociali nell'autismo: Una review critica [Robotics and the development of social skills in autism: A critical review]. *Mondo Digitale, 18*(82), 1–24. https://mondodigitale.aicanet.net/2019-3/Articoli/01_MD82_Robotica_e_sviluppo_delle_abilita_sociali_nell_autismo.pdf

Picard, R. W. (1997). *Affective computing*. MIT Press. https://doi.org/10.7551/mitpress/1140.001.0001

Poria, S., Cambria, E., Bajpai, R., & Hussain, A. (2017). A review of affective computing: From unimodal analysis to multimodal fusion. *Information Fusion, 37*, 98–125. https://doi.org/10.1016/j.inffus.2017.02.003

Ramachandran, V. S., & Oberman, L. M. (2006). Broken mirrors: A theory of autism. *Scientific American, 295*(5), 62–69. https://doi.org/10.1038/scientificamerican1106-62

Raulston, T. J., & Hansen, S. G. (2022). Promoting generalization of social skills to inclusive play settings for children with autism and their peers. *TEACHING Exceptional Children, 54*(6), 434–439. https://doi.org/10.1177/00400599211025550

Rizzolatti, G., & Sinigaglia, C. (2006). *So quel che fai: Il cervello che agisce e i neuroni specchio* [I know what you are doing: The acting brain and mirror neurons]. Raffaello Cortina.

Rudovic, O., Lee, J., Dai, M., Schuller, B., & Picard, R. W. (2018). Personalized machine learning for robot perception of affect and engagement in autism therapy. *Science Robotics, 3*(19), Article eaao6760. https://doi.org/10.1126/scirobotics.aao6760

Short, E. S., Deng, E. C., Feil-Seifer, D., & Matarić, M. J. (2017). Understanding agency in interactions between children with autism and socially assistive robots. *Journal of Human-Robot Interaction, 6*(3), 21–47. https://doi.org/10.5898/JHRI.6.3.Short

Stern, D. N. (2010). *Forms of vitality: Exploring dynamic experience in psychology, the arts, psychotherapy, and development*. Oxford University Press. https://doi.org/10.1093/med:psych/9780199586066.001.0001

Vivanet, G. (2014). Che cosa sappiamo sull'efficacia delle tecnologie didattiche con soggetti con disturbo dello spettro autistico? [What do we know about the effectiveness of educational technologies with individuals with autism spectrum disorder?]. *Form@re – Open Journal per la formazione in rete, 14*(4), 77–92. https://doi.org/10.13128/formare-15798

Wood, D., Bruner, J. S., & Ross, G. (1976). The role of tutoring in problem solving. *Journal of Child Psychology and Psychiatry, 17*(2), 89–100. https://doi.org/10.1111/j.1469-7610.1976.tb00381.x

Zappalà, E. (2021). Ambienti di apprendimento ibridi per l'inclusione degli allievi con ASD: Verso una progettazione ecologica [Hybrid learning environments for the inclusion of students with ASD: Towards an ecological design]. *Journal of Inclusive Methodology and Technology in Learning and Teaching, 1*(1). https://doi.org/10.32043/jimtlt.v1i1.14