

Neurodivergent Families and Pedagogies of Hybridization: Towards Inclusive Educational Ecologies within Post-Digital Transitions

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Abstract: In the post-digital context, cultural and technological transformations call for a rethinking of educational practices in light of the complexity of “neurodivergent” families, particularly those with children on the autism spectrum. This contribution explores the potential of pedagogies of hybridization in fostering inclusive educational ecologies capable of integrating diverse languages, technologies, and forms of knowledge. From an ecological and systemic perspective, families are regarded as emerging pedagogical actors, co-constructing hybrid educational environments where the digital becomes both language and relational space. The analysis highlights informal and techno-mediated educational practices that challenge the rigidity of traditional schooling systems, generating micro-ecologies of learning grounded in care, interdependence, and the recognition of plurality. In dialogue with the inclusive pedagogical perspective, neurodivergence is understood as a socio-cultural construction rather than merely a form of disability. Families thus emerge as generative spaces of situated knowledge, capable of inspiring more equitable and flexible educational models. Within post-digital transitions, inclusion is conceived as an evolutionary reformulation of educational spaces and contexts, oriented toward the promotion of hybridization, co-design, and the valorization of neurocognitive plurality.

Keywords: family, school, inclusion, new digital technologies, neurodivergence

1. Introduction

The post-digital era we inhabit calls for a deep and renewed reflection on educational practices and pedagogical models, particularly considering ongoing cultural, technological, and social transformations. The pervasiveness of digital technologies is no longer merely an integrative tool but has become the very context and language of new forms of learning, communication, and relationships (Calvani & Bonaiuti, 2019). This transformative evolution intersects with the challenges posed by the complexity of neurodivergent families, characterized by the presence of children with atypical intellectual development, such as those on the autism spectrum (ASD). In this sense, neurodivergence represents not only a condition to be considered but an epistemic diversity to be valued to rethink educational practices through an inclusive and relational lens (Cottini, 2016). It is therefore necessary to explore the potential of pedagogies of hybridization to integrate and interconnect knowledge, languages, and technologies, with the aim of shaping inclusive educational ecologies capable of effectively addressing the needs emerging from neurodivergence in contemporary educational transitions. From this perspective, pedagogical hybridization enables the



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overcoming of traditional dichotomies, formal/informal, human/technological, ability/disability, offering a paradigm that embraces the plurality of ways of being and learning (Fogarolo & Onger, 2017; Canevaro, 2014). This process unfolds within a systemic and ecological vision that recognizes the centrality of the family as an active pedagogical agent, a generator of situated knowledge and hybrid practices contributing to the creation of flexible and accessible educational environments (Ianes, 2005; 2021). In the post-digital context, educational transitions require a reconfiguration of spaces, relationships, and good practices, considering the coexistence of physical and digital environments and the growing interdependence between technologies, bodies, and social contexts. Neurodivergent families, especially those with children on the autism spectrum, often operate within fragmented and non-inclusive educational systems, engaging in advocacy, rights promotion, and educational negotiation, alongside care and mediation practices that define them as essential transformative actors (Cappe & Bolduc, 2021; Giovagnoli et al., 2015; Vaccari & Zappella, 2020). It thus becomes crucial to value these hybrid family practices, often informal and techno-mediated, as micro-ecologies of education capable of challenging ableist and normalizing logics while promoting an inclusive perspective grounded in the recognition of difference as a value. A careful analysis of the potential offered by emerging technologies highlights the role of artificial intelligence and immersive learning environments as tools for building transformative alliances among schools, families, and communities. These technologies not only personalize learning but also help envision more just, intersectional, and co-designed educational ecologies (Bertolini, 2004; Demetrio, 2018), capable of transcending current theoretical boundaries and affirming an inclusive, situated, and transmedial pedagogy oriented towards the appreciation of human neurocognitive plurality.

2. Neurodivergent Families as Pedagogical Actors in Hybrid Ecologies from an Inclusive Perspective

In the contemporary context of post-digital transitions, neurodivergent families are increasingly emerging as essential pedagogical actors in the shaping of new inclusive educational ecologies. These family units, characterized by the presence of members with neurodiversity, particularly children and adolescents on the autism spectrum, are not only engaged in the daily challenges of education and support but also act as generative spaces of pedagogical innovation, resilience, and experimentation with hybrid forms of learning. Unlike medicalized approaches that pathologize neurodivergence, this perspective values families as active protagonists in redefining inclusive education, helping to overcome traditional dichotomies such as ability/disability and human/technological (Ianes, 2005, 2021; Canevaro, 2018). The ecological and systemic approach views neurodivergence as an expression of human neurocognitive plurality that unfolds within complex, interconnected educational, social, and technological contexts (Bronfenbrenner, 1977; Bertolini, 2004). Families thus become micro-ecologies of education, where formal and informal practices, digital tools and affective relationships, autobiographical narratives and community networks intertwine. This model of pedagogical hybridization deconstructs existing epistemological and normative barriers (Calvani & Bonaiuti, 2020; Cottini, 2019). Families of autistic children develop educational strategies that both challenge and complement traditional schooling systems, combining formal and informal, analog and digital, normative and experimental elements. The use of assistive technologies

and immersive learning environments, such as tablets with specific software, augmentative communication tools, and virtual reality, goes beyond mere instrumental support to become a language and context for building shared meaning and new forms of educational relationships (Fogarolo & Onger, 2017; Vaccari & Zappella, 2020). These technologies, integrated with family mediation practices, foster transformative alliances among family, school, and community, enabling continuous, intergenerational, and post-disciplinary learning. Such processes embody educational agencies, in which neurodivergent individuals and their families act not as passive recipients but as co-designers of individualized and situated learning pathways (Giovagnoli et al., 2015; Cappe & Bolduc, 2021). Adopting a pedagogy of hybridization allows for the deconstruction of long-standing separations, formal/informal, digital/analog, normal/special, human/technological, thereby challenging ableist and normalizing paradigms that have historically constrained inclusive practices (Ianes, 2021; Canevaro, 2018). The concept of educational ecology, integrating relational, systemic, and intersectional perspectives, provides a theoretical framework for understanding these transformative processes. Neurodivergent families, through their hybrid practices, act as pedagogical laboratories of innovation, where technology is not merely a tool but an integral part of a web of relationships and meanings that redefine learning and socialization (Demetrio, 2018; Bertolini, 2004). The affective and relational dimensions play a central role in these ecologies: educational processes are always situated within everyday contexts of care, mediation, and resilience, profoundly shaping the developmental and learning potential of children with ASD (Calvani & Bonaiuti, 2020; Cottini, 2019).

The educational practices enacted by families often constitute non-formal pedagogical interventions, characterized by creative adaptations, relational experimentation, and ongoing negotiation—a true “submerged pedagogy” that, though informal and often unrecognized, represents a vital epistemic resource for rethinking inclusive educational models (Giovagnoli et al., 2015; Vaccari & Zappella, 2020). Neurodivergent families demonstrate a remarkable ability to integrate digital tools and technological resources critically and contextually, avoiding passive or merely instrumental use. This reflective engagement with technology enhances the communicative, expressive, and relational capacities of autistic learners, enabling flexible, neurocognitively responsive learning pathways (Fogarolo & Onger, 2017; Cappe & Bolduc, 2021). Moreover, digital spaces become arenas for autobiographical narration and identity construction, where experiences are shared, and online communities provide support, inclusion, and empowerment. These environments, extending beyond formal schooling, facilitate diffuse and lifelong learning (Bertolini, 2004; Demetrio, 2018). The complexity and innovation of family practices call for a radical rethinking of teacher education, preparing educators to operate in fluid, hybrid, and post-digital contexts. Teacher training should thus foster ecosystemic, design-oriented, and digital competencies, recognizing neurodivergence as a fundamental epistemic resource (Ianes, 2021; Calvani & Bonaiuti, 2020). In this framework, co-design entails a continuous dialogue among families, schools, and communities, grounded in care, listening, and the recognition of differences. The challenge is to design inclusive educational systems that sustain the educational agency of neurodivergent individuals and their families, promoting educational justice (Canevaro, 2018; Cottini, 2019). Neurodivergent families therefore represent a crucial node in contemporary educational transformations. Their ability to generate hybrid practices and inclusive mi-

cro-ecologies, mediated by digital technologies and enriched by affective relationships, challenges traditional pedagogical models and opens pathways toward flexible, equitable, and sustainable education. The pedagogical hybridization paradigm offers both a theoretical and operational framework to value this complexity, centering neurodivergent subjectivities and the plurality of ways of learning and being. Only through a critical, intersectional, and relational outlook can truly inclusive educational ecologies be designed for post-digital transitions.

3. Technologies, Narratives, and Co-Design: New Perspectives for Inclusive Educational Ecologies

The pervasiveness of digital technologies and their integration with physical environments have opened new horizons for educational ecologies, particularly for neurodivergent families. Although still marked by inequalities and fragmentation, technological transformations offer innovative tools for individualized and personalized learning and for building community support networks, overcoming the limits of traditional educational approaches and fostering spaces of empowerment and agency (Calvani & Bonaiuti, 2020; Cottini, 2019). One of the most significant pathways concerns the adoption of artificial intelligence (AI) and immersive learning environments as educational support tools. AI technologies, through speech recognition systems, behavioral analysis, and automatic content personalization, allow learning strategies to be dynamically adapted to individual neurocognitive characteristics. For instance, AI-based applications can monitor, in real time, the emotional and behavioral signals of learners with ASD, suggesting timely and targeted interventions for teachers and families (Fogarolo & Onger, 2017). Virtual (VR) and augmented reality (AR) environments provide safe and controlled experiential spaces where neurodivergent individuals can progressively develop social, communicative, and cognitive skills in personalized ways. These environments enhance multisensory engagement and allow the simulation of complex situations that are often challenging in everyday contexts, supporting processes of generalization and automation (Vaccari & Zappella, 2020). Such technological tools must be conceived as components of an ecological learning system, integrated with family, school, and community practices. Their effectiveness depends on the ability of teachers, families, and designers to adopt a critical, ethical, and participatory approach that centers neurodivergent subjectivities while respecting their uniqueness and dignity (Canevaro, 2018). The creation of autobiographical narratives represents another cornerstone of hybrid educational ecologies. Through digital technologies, neurodivergent families can share experiences, strategies, and reflections, creating support networks and communities of practice. The narrative dimension is profoundly transformative: sharing daily challenges and educational achievements not only strengthens families' sense of belonging and identity but also generates cultural and political impact, challenging stereotypes and pathologizing representations of neurodivergence. Through narrative, families influence educational and social policies, fostering cultural renewal (Giovagnoli et al., 2015). The rise of hybrid and techno-mediated practices necessitates a rethinking of educational design models, recognizing co-design as a central paradigm of inclusion. Co-design entails continuous and equitable dialogue among families, schools, social-educational services, and local communities, contributing to the creation of individualized, flexible, and contextualized learning pathways (Ianes, 2021; Calvani & Bonaiuti, 2020). It becomes a practice of educational justice, one that

values the plurality of ways of learning, acting, and being, while promoting care, shared responsibility, and the sustainability of educational ecologies (Cottini, 2019; Canevaro, 2018). However, neurodivergent families often inhabit fragmented educational and social systems, marked by unequal accessibility, lack of coordination, rigid regulations, and cultural prejudice. These barriers hinder the realization of inclusive educational ecologies and call for systemic and integrated interventions at the political, educational, and social levels (Vaccari & Zappella, 2020). It is crucial to move beyond medicalized approaches that still permeate many educational practices and policies, replacing them with relational and socio-cultural perspectives that recognize difference as value and promote empowerment for individuals and families (Ianes, 2021; Canevaro, 2018). Teacher training must therefore be reimagined to include digital, ecosystemic, intercultural, and intersectional competences, supporting truly inclusive and innovative pedagogical practices. Collaboration among universities, schools, families, and communities is essential for developing suitable educational models and spreading good practices (Calvani & Bonaiuti, 2020; Cottini, 2019). Hybrid educational ecologies represent an evolving field of research and practice that demands multidisciplinary and participatory approaches, grounded in dialogic exchange to understand and value the complexity of neurodivergent learners and their families (Giovagnoli et al., 2015). The ultimate goal is to promote a situated and transmedial inclusive pedagogy capable of inhabiting the “special normality” of contemporary family and school contexts (Demetrio, 2018; Ianes, 2021). A key analytical dimension in hybrid educational ecologies is the intersectional and cultural nature of neurodivergence, manifested in the diversity of familial experiences and contexts. Neurodivergent families are not a homogeneous group but exist across multiple axes of inequality, social, cultural, economic, and territorial, that significantly influence educational strategies and access to resources. As Calvani and Bonaiuti (2020) emphasize, an intersectional perspective requires educational interventions that recognize neurodivergence as a situated phenomenon within complex socio-cultural frameworks. Digital technology, though potentially inclusive, can also reproduce or amplify inequalities if not supported by equitable educational and social policies attentive to disparities in access and digital literacy. Hybrid practices must therefore be critically designed to avoid a digital divide that marginalizes vulnerable groups (Cottini, 2019). This critical focus is vital for the sustainability of educational ecologies, which must be accessible, effective, and culturally responsive. Neurodivergent families, particularly those with children on the autism spectrum, are emerging as active and creative agents in constructing hybrid educational practices. As Giovagnoli et al. (2015) note, these families often develop post-disciplinary and intergenerational learning forms that transcend traditional school boundaries. Through the combined use of assistive technologies, digital platforms, and storytelling, they create micro-ecologies of learning that integrate formal and informal resources, broadening the very notion of the educational environment. As emerging pedagogical actors, these families help redefine educational norms, advancing an approach that recognizes difference as both an epistemic and pedagogical resource (Ianes, 2021). Another crucial dimension is the affective and relational foundation of inclusive learning. Hybrid practices must not be reduced to mere combinations of tools and methods; they must incorporate care, empathy, and emotional co-presence. Canevaro (2018) highlights that neurodivergence is the outcome of educational and social relationships, and inclusive education must therefore be rooted in mutual recognition and respect. The family

represents the primary environment of care and relationship, where learning and development take root. The integration of digital technologies should thus be enhanced rather than replace human connection, offering multiple channels for expression, communication, and participation. For instance, digital tools can support communicative mediation for learners with complex communication needs, expanding their expressive and relational capacities (Vaccari & Zappella, 2020). The scope of hybrid educational ecologies extends beyond family and school, encompassing territory and local communities as essential resources. Both physical and digital community networks serve as spaces of support, exchange, and experimentation, where families and educators collaborate to co-design innovative educational practices. This participatory configuration fosters socio-cultural inclusion and strengthens the relational and cooperative resources that sustain inclusivity and value neurodivergent subjectivities (Demetrio, 2018). Digital communities, for example, help overcome geographic and social isolation, enabling the sharing of experiences, tools, and educational strategies. Simultaneously, the active engagement of local communities supports the design of inclusive, accessible, and sustainable educational spaces, integrating formal and informal knowledge into a cohesive and dynamic system (Calvani & Bonaiuti, 2020). In this sense, Cottini (2019) proposes a teacher education model grounded in cultural and digital mediation, critical analysis of educational tools, and participatory design, with particular attention to marginalized subjectivities. The goal is to train professionals capable of working within multidisciplinary teams, maintaining constant dialogue with families and communities to create flexible and inclusive educational ecologies. Moreover, the perspective of pedagogical hybridization requires continuous field-based experimentation and reflexive innovation, supported by cyclical collaboration between research and practice. This also implies revising assessment systems, moving beyond standardized criteria toward relational and context-sensitive indicators (Ianes, 2021). Ultimately, any educational design that integrates digital technologies and hybrid practices must be governed by an ethics of care and responsibility. Inclusion cannot be conceived as a mere technical or functional adaptation but as a deep commitment to educational justice, recognition of diversity, and promotion of human dignity. Inclusive educational ecologies should ensure that all learning environments respect differences, value the competences of all actors involved, and promote active and conscious participation (Bertolini, 2004; Demetrio, 2018). The integration of technologies, narratives, and co-design offers a powerful perspective for overcoming physical and cultural barriers and for enabling hybrid, flexible, and inclusive educational ecologies. The central role of neurodivergent families, the ethics of care in relationships, and the attention to inequalities form the foundation for envisioning a future of education capable of inhabiting post-digital complexity with responsibility and respect.

4. Conclusions

This contribution has highlighted how the cultural, technological, and social transformations of the post-digital context demand a profound reformulation of educational practices, particularly from an inclusive perspective, in which neurodivergence emerges as a complex and multifactorial phenomenon to be interpreted through relational, situated, and non-medicalized lenses (Cottini, 2019). From this standpoint, neurodivergent families should no longer be viewed as mere recipients of educational interventions but as fundamental and generative pedagogical actors,

bearers of situated knowledge, hybrid strategies, and transformative agencies that challenge the norms and rigidities of traditional schooling (Demetrio, 2018). The pedagogy of hybridization thus emerges as a paradigm capable of deconstructing longstanding dichotomies, formal/informal, digital/analog, ability/disability, offering theoretical and practical tools to envision inclusive educational ecologies that integrate affective, cognitive, social, and technological dimensions. Family practices, often informal and techno-mediated, represent laboratories of pedagogical innovation and resilience, which valorize the plurality of ways of being and learning, supporting an inclusive perspective based on the recognition of difference as intrinsic value (Calvani & Bonaiuti, 2020). Moreover, this analysis has underscored that attention to intersectionality and the socio-cultural dimensions of neurodivergence is essential to prevent digital technologies from reproducing or amplifying inequalities, and instead to ensure accessibility, equity, and sustainability. In this direction, families and local communities play a strategic role in the co-design of flexible, participatory, and inclusive educational environments, weaving together formal, informal, and digital networks. Teacher education stands out as a focal point for the evolution of authentically inclusive educational practices in contemporary contexts. It is no longer sufficient to pursue merely technical digital competence; rather, it is necessary to promote a training paradigm oriented toward complexity, integrating pedagogical knowledge, relational skills, and critical-ethical awareness. Teacher education should thus be guided by a systemic and transdisciplinary perspective, capable of combining the mindful use of technology with the human dimension of teaching (Calvani & Bonaiuti, 2020). This entails recognizing the centrality of mediation, both cultural and digital, and adopting co-design practices grounded in an ethics of care, social responsibility, and shared educational agency among schools, families, and local communities. Furthermore, this reflection situates itself within a broader framework of eco-social crises and epochal transitions, which call for a radical rethinking of educational and didactic inhabiting. In this context, inclusion is no longer a mere functional adjustment, but a process of epistemological and pedagogical reformulation oriented toward educational justice and the subjectivation of neurodivergent individuals (Cottini, 2019). Emerging scenarios highlight the urgency of advancing research and educational practices that explore the potential of pedagogical hybridization, experimenting with ecosystemic and transdisciplinary models capable of integrating technology, narrative, relationship, and educational care. Only through a collective commitment, one that centers the voices and experiences of neurodivergent families, will it be possible to design truly inclusive and sustainable educational ecologies, capable of inhabiting the complexities of the post-digital world with dignity, innovation, and care.

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