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OnLIFE Education: the ecological dimension of digital learning architectures[1]

Educação OnLIFE: a dimensão ecológica das arquiteturas digitais de aprendizagem

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ABSTRACT

The past generations of communication and interaction networks have started to extend connectivity to objects (internet of things), surfaces, and environments (sensors), thus creating interactive ecologies (the internet of everything), in which all the different entities (data, algorithms, software, things, territories, people) develop their actions and possibilities in dialogues and through each other. Such transformation determines the transition from the frontal and analog learning architectures to reticular and digital dimensions. The digitization of the world and the widespread connection enable the construction of networks and interactive and connective architectures, in which learning comes to be understood from an ecosystemic logic where human actors and several entities (which digitalization has given voice to) dialogue and, in a process of interdependence, build an intelligent ecology. From this context, emerges a new relational, ecological culture linked to indicators and criteria of sustainability, which allows us to speak of OnLIFE Education in a hyperconnected reality in which "real" and "virtual" merge, instigating institutions, teachers, and students to rethink the educational system as an ecosystem. The article, based on a reflection on the new planetary connection and network living, questions what problems

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and challenges this new reality poses for Education. It presents three interpretative approaches to the human-digital technology relationship in an educational context and ends with reflections on OnLIFE Education.

Keywords: OnLIFE Education. Learning. Interactive Ecologies. Ecosystem. Hyperconnected Reality.

RESUMO

As últimas gerações de redes de comunicação e de interação começaram a estender a conectividade aos objetos (*internet of things*), às superfícies e ao meio-ambiente (sensores), criando ecologias interativas (*the internet of everything*) nas quais todas as diversas entidades (dados, algoritmos, software, coisas, territórios, pessoas) desenvolvem suas ações e possibilidades em diálogos e por meio das demais. Tal transformação determina a passagem da forma de arquiteturas de aprendizagem frontais e analógicas, para dimensões reticulares e digitais. A digitalização do mundo e a conexão generalizada possibilitam a construção de redes e de arquiteturas conectivas interagentes, nas quais a aprendizagem passa a ser compreendida, a partir de uma lógica ecossistêmica em que atores humanos e entidades diversas (às quais a digitalização deu voz) dialogam e, num processo de interdependência, constroem uma ecologia inteligente. Desse contexto emerge uma nova cultura relacional, ecológica, ligada a indicadores e critérios de sustentabilidade, o que nos permite falar de uma Educação *OnLIFE*, numa realidade hiperconectada, na qual o "real" e "virtual" se (con) fundem, instigando instituições, professores e estudantes a repensar o sistema educativo, enquanto ecossistema. O artigo, a partir da reflexão sobre a nova conexão planetária e o habitar em rede, questiona que problematizações e desafios essa nova realidade coloca para a Educação. Apresenta três abordagens interpretativas da relação humano-tecnologia digital em contexto educacional e, finaliza com elaborações sobre a Educação *OnLIFE*.

Palavras-chave: Educação *OnLIFE*. Aprendizagem. Ecologias Interativas. Ecossistema. Realidade Hiperconectada.

The internet of everything: the new planetary connection

The most populous nation in the world is Facebook, with about 2 billion and 196 million citizens, more than double the inhabitants of China. The second is YouTube, with around 1 billion and 900 million. The third is WhatsApp, with 1 billion and 500 million.

The history of the Internet, observed today, after a few decades of its dissemination, seems to us to be clearer and more easily understood. Today, in the era of the internet of things, digital platforms, and blockchains, the evolutionary nature and qualities of its historical process are striking. Only today, it is possible to affirm that that technological and informational process, initiated with the Arpanet[2], to create a type of information capable of reconstituting, even if it was hit at various points, by weapons of mass destruction, it was fundamentally a process of building networks and connecting architectures for interaction.

The social internet (web 2.0), the internet of things (IoT), and the data internet (Big Data) are not separate networks. On the contrary, in an analogous way to ecosystemic logic, they are integrated and interdependent parts that make up a network of networks called the internet of everything, the network of all things.

Today, the digitization process appears as a new type of planetary connection, that is, as the constitution of interacting networks composed not only by human beings and technologies but also by biodiversity, objects, surfaces, data, neural networks of intelligence, etc. Unlike the one described in the 1990s by P. Lévy, today the internet is no longer just a collective intelligence, but a network of data networks that, through mobile devices, software, sensors, constitute the dynamic environment in which we live and interact every day. In this, in addition to receiving and exchanging information and content, interactive spatialities are continuously formed, that is, ecologies composed by humans and diverse entities within which each member is connected and dependent on the others.

In these connective architectures, interacting means, therefore, in addition to exchanging information, changing the living condition itself, displacing our sociability, our geography, and our being in computerized environments. They are by no means virtual architectures, that is, platforms external to our social and separate from the physical world. On the contrary, while inserted inside, they are an active and influential part of it. Just look at what happened to our relationships from the spread of social networks and interaction networks.

Our social, physical, and theatrical situation (GOFFMAN. E, 1988) became informative. More than a simple extension of our relationships on a virtual plane, our connected lives express a qualitative transformation of the very nature of the social. Once connected, we transform our sociability into something plural, both face-to-face and informative, close and distant, public and private. A new type of conviviality, connected and unlimited, extended in spatiality, and not only in

2 Arpanet was a project created by the United States Department of Defense in 1969, after the missile crisis of 1962, with the objective of developing an information system capable of reconstructing and transmitting information, even if it was hit by an attack with atomic weapons.

physical personal relationships, "face-to-face", but characterized by connective forms that, through its translation into bits, continuously transform people, streets, squares, houses, things, in data networks, creating an unprecedented and hybrid condition, defined by L. Floridi (2015) "on-life".

Unlike the industrial information models launched by Elihu Katz, Paul Lazarsfeld (1966) and Umberto Eco (1975), as well as all others that described the mass media's information flow as based on the opposite symmetries between emitters and receivers, the new model, emerging from network connections, consists of the advent of a new communicative architecture. Complex network architectures are based on a diverse information structure and another communication principle. If the models of analog communication were inspired by the forms of industrial production systems, reproducing their forms and proposing the analogy between the process of mass production of goods and content with that of the production of information, the form of complex and connected networks challenges the language of communication science, offering, at the same time, the possibility of rethinking the very idea of communication, in addition to its linear geometric representations.

Accoto (2017) describes the new architectures of information networks from the reconstruction of their composition, which he interprets as based on five parts: *the software code*, *the algorithms*, *the sensors*, *the data*, and *the platforms*.

> If the question posed by L. Manovich was to ask what has happened to the media since the advent of software, here we must choose to expand the spirit of analysis and ask ourselves what happens when software becomes, as philosophers say, the horizon of experience [...] We must ask ourselves, that is, not only what is the media after the arrival of software, but what is the world after the advent of software, which feeds on sensors and data, which incorporates algorithms, that is pushed more and more towards artificial intelligence and that today is embodied in powerful socioeconomic platforms [...] the software profoundly transforms our concept of what is possible. In short: the code redefines, ontogenetically, the conditions of possibility of the world (ACCOTO, 2017, p. 13).

The dissemination of these new interaction architectures created a new type of network called "internet of all things", which, after people, objects, biodiversity, trees, etc., started to connect all types of surfaces, creating an unprecedented planetary ecology which, in the book, "*Net-ativismo: da ação social para o ato conectivo*", is described as follows:

> Today, the Internet is no longer a computer network and has assumed global dimensions, digitizing part of the biosphere and creating an incalculable amount of data and connecting, from them, the different dimensions of the globe. The different types of connections and the different forms of perception that today extend beyond the limits of technology, reaching forests, the seabed, other planets and stars express the forms of another type of ecology and a living condition that is no longer limited to a network of information transmitted by the computer. The Internet is no longer a technical network and it is no longer just a network of people and citizens: we are faced with the advent of a new planetary connection, but different from the one that united the knowledge of human intelligence to the world, as elaborated by the work of P. Lévy. The new forms of connection that have been established in the last generations of networks and that are digitizing the biosphere are transforming us, from citizens of countries, cities and nations, to citizens of the galaxy of bits (DI FELICE, 2017, p. 45).

This new planetary connection defines a new morphology of the common, a new ecological context that is no longer social, in other words, composed only of human beings, but also formed by the informative role of things, rivers, forests, roads, algorithms, data, etc. The digitalization of the world, in addition to giving voice to non-humans, stimulating, for the first time in the history of our species, a fertile dialogue between us and other entities and substances, is at the base of the diffusion of a new ecological culture linked to indicators and criteria sustainability. The dissemination of sensors and forms of labeling surfaces, in addition to giving voice to non-human entities, contributed to the weakening of the western myth of the centrality of our species, transforming the idea of *Homo sapiens*, as the center of the universe, as the only subject actor, in an open entity and member of a complex relational ecology. More than an independent subject, in the context of connective networks, the networked being becomes a dependent entity, linked, for the realization of their action, to other entities, and complex networks of interactions. No longer just dependent and conditioned by air, water, raw materials, as it has always been, but also linked to software, algorithms, data, sensors, information flows, and devices.

The inhabiting networks

> Bacteria, fungus, whale, sequoia: we do not know any living being that we can say that does not emit information, does not receive it, does not store it and does not treat it [...].
> Crystal, rock, sea, planet, star, galaxy, we no longer know anything inert about which we can say that it does not send information, does not receive it, does not store it and does not deal with it [...].
> Individual, family, farm, village, metropolis, nation: we do not know any human being, alone or in a group, of which we can say that he does not send information, does not receive it, does not store it and does not deal with it (SERRES, 2017, p 64).

In the wake of the process of connecting things (internet of things), the algorithmic management of relationships in digital social networks, the non-human organization of infinite data flows (big data), and the ways of sensing surfaces and ecosystems, the digitization process is no longer just a communicative phenomenon to become something qualitatively different. More than a virtualization process, the transformation of things, roads, relationships, forests, rivers, and cities into data, gave life to a computerized dimension of the real, characterized by a digital dynamism, resulting from algorithmic and automated treatments of flows informative.

Once the form of the data was taken, the squares, streets, steeples, cypresses, elephants, yogurts, and our DNA, despite preserving their original, material and physical dimension, alter their nature and, becoming information, have passed to assume a later format, which transforms them into information flows and separable and aggregable sequences. This new world, made of data, is not separate and distinct from the visible world, made of stones, bricks, matter, and flesh, but it is its transfigurations, since it is capable, by its connective dynamism, of multiplying its forms and possible modes. Thus, all reality becomes dynamic and modifiable, acquiring a plurality of versions that transform it, in an objective and "real" way, into a possible and connective architecture.

The objective world, a unique and materially finite reality, has thus become a programmable reality, neither material nor virtual, information-matter, computerized materiality, pixel-matter, emerging, and in continuous transformation, acquiring a historical and living dimension, similar to that of a living organism.

The computerized essence of the world, due to its multiple natures, materials, and information at the same time, reveals a dimension, which is no longer ontological, but intermittent, mutant and accessible only in a connective way, which is, through the interaction with software, data, and interfaces.

The set of data worlds that we are: organic, inorganic, animal, vegetable, rational, robotic, algorithmic, etc. today, it is an architecture of informational and communicative networks. The worlds that we thought of as separate realities (organic, inorganic, animal, vegetable, rational, robotics, etc.) are today digitally connected and interacting.

The world we inhabit is no longer just the physical and visible, but a complex and inseparable set of worlds, and informational and material combinations. An info-world. A network of networks.

This new ecology, which connects diverse entities, questions our idea of the environment. The relationship between man and the environment has been presented and narrated, within Western culture, as a frontal and oppositional relationship. The very word environment (from the Latin *ambire*, "what's around") refers to the distinction and separation between the human and his surroundings. The Greek concept of nature, "φύσις", established the idea of a distance between the human subject and the external world, an idea present, both in the Judeo-Christian creationist tradition and in all the philosophy of the old continent.

In contrast to this conception, the perspective of network ecology, based on the complex description of the relationships between individual, biodiversity, technique, information, and territory, unlike the Western tradition, makes visible the interdependencies between each of the different members that no longer appear as distinct realities, while their processes of modification and their characteristics are produced and developed from the relationship with others. According to this perspective, the traditional concepts of separation that oppose man to the environment, to technique, to nature are replaced by the ecosystemic perception of a living condition that redefines each entity no longer as an autonomous reality, but as part of a relational form that it acquires its specific condition only through different interactions and connections.

This concept is reflected in different expressions of contemporary digital cultures, in which the idea of an information system takes on the meanings of the network form. In these spheres, there is no longer either externality or internality, but connections.

Starting from a free interpretation of the idea of inhabiting, inspired by Martin Heidegger's relational ontology, it is possible to rethink the habitual condition from the notion of communicative forms. The perspective of the communicative forms of living describes a complex communicative ecology

that is no longer based on the interactions between subjects and media, between humans and nature, etc., but from connections of interactive ecological networks[3]. Dwelling becomes, therefore, no longer the consequence of a subject's relationship with a specific place or an objective relationship between the individual and the territory, but the result of multiple communicative practices between members of a complex ecological network, formed by human beings, data, sensors, software, algorithms, forests, roads, etc.

The introduction of informational ecosystems and augmented realities not only started to reproduce environments that can be crossed through the mediation of interaction devices but also brought into question the very objective meaning of space and environment. Overcoming the architectural and topographic concepts of space, the idea of the communicative form of living, as well as that of living in a network, assume the meaning of a strategic concept for thinking and describing the informative qualities of the transformations that affect our time and our society.

Although we have never walked on the white expanses of the Arctic, nor have we ever had to deal with a polar bear, except in the zoo, we are well aware of the progressive reduction in the thickness of glaciers, as well as the behaviors and difficulties encountered today by animals that live in poles, after climate change and temperature rise. Although most of the inhabitants of the planet have never set foot in a tropical rain forest, nor have they, therefore, experienced the attack of "mosquitoes" of any kind that, incessantly, feed on our blood in a context where everything is in everything, and every living being is, at the same time, prey and predator, we know the importance of the process of photosynthesis, transpiration and oxygen emission from tropical rain forests, for the balance of air quality within the biosphere.

Locked in our rooms, surrounded and protected by kilometers of concrete and asphalt, albeit distant and separate, we now have access to the most remote areas of our planet, through the connection to devices, data, and sensors that allow us to see, know, monitor the forests, glaciers, deserts, and interact with the diverse networks of Gaia.

3 In the book *Paisagens pós-urbanas*, Di Felice (2009) presents three communicative forms of historical and non-diachronic habitation: the communicative form of reading habitation, the communicative form of electricity dwelling, the communicative form of digital habitation, each of which describes specific ecological forms and promotes specific forms of interaction between the various members. *Paisagens pós-urbanas*: o fim da experiência urbana e as formas comunicativas do habitar, São Paulo: Annablume, 2009.

Sitting comfortably on our sofa, or chair, at our desk, thanks to networks and data flows, we travel through distant ecosystems and environments. Connected to the informational architectures of the networks, we can feel the breath of Gaia, and see and know its infinite connections, between the members, and the surfaces that compose it. Connected to networks, we feel, see, and know, no longer just through our five senses. An unprecedented trans-organic form of feeling, based on neither organic nor artificial sensoriality, has now become familiar to us.

We no longer inhabit only physical spaces and territories, but a new type of computerized territoriality, accessible only from digital informational devices and architectures. Our housing condition has changed in recent decades. We went from the visual architectures of cinema and TV, which reproduced landscapes, transforming the world and reality into images, to a connective information architecture that, transforming all reality and surface into binary code and bits, enabled the hybridization of substances and the creation of new ways of dwelling. The latter are presented, more than characterized by the digital duplication of territories (spaces and virtual worlds), as the proliferation of info-ecologies composed of hybrid and plural spatialities, simultaneously material and informative.

A geographic information system (GIS) is a complex architecture composed of physical spaces, roads, buildings, trees, squares, etc., which, after the acquisition of a digital format, take on an informative form and condition, becoming multiple spaces and open. Thus, info-material architectures, physical and digital spatialities emerge at the same time, places of inhabiting that are difficult to define.

After the emergence of the Internet of Things, people, devices, data, sensors, software, objects, animals, and trees began to interact, creating an unprecedented ecology that is increasingly becoming our natural habitat and our common world.

Such living condition can no longer be expressed through the ecologies of Greek nature (φύσις), composed of material spaces, inhabited by human beings and characterized by relations between subjects and objects.

This idea of living, human, natural, and semantic[4], succeed that of a reticular communicative dwelling, whose form is atopic[5], that is, emerging and connective.

4 See Guattari, F. *Les trois écologies*. Paris: Galilèe, 1989.

5 For a better understanding on atopic, check my book *Paisagens pós-urbanas*: o fim da experiência urbana e as formas comunicativas do habitar. São Paulo: Annablume, 2009.

A complex ecology within which substances and surfaces, from the computerization process and its transfiguration in digital binary code (010101), connect and change.

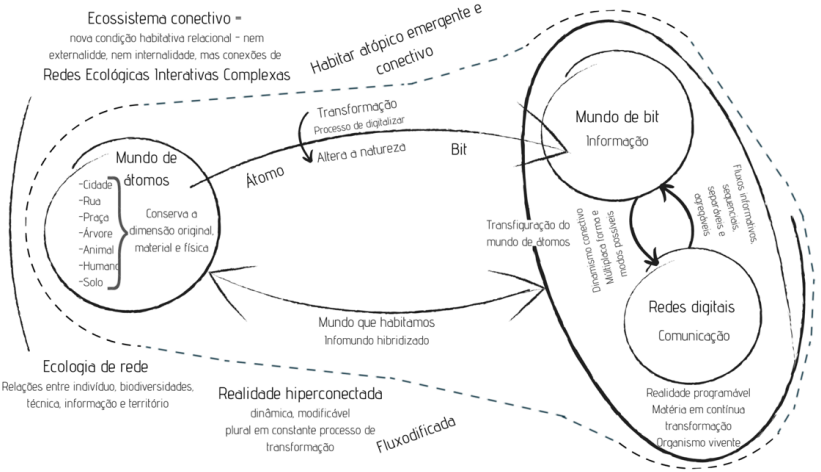
Reticular and digital info-ecologies are, therefore, a "formant form"[6], that is, a "shape that shapes" and, at the same time, an info-architecture that is always changing and, consequently, indefinite. They have no fixed form, neither nature nor ontology. It is not external architectures that are before us, nor internal representations that we create and imagine. They are similar to the ecologies and organizational structures of complex living systems.

The Greek term *atopos*, within the Western philosophical tradition, does not find its specific meaning in the literal translation (not place), but in what puts it concerning its ambiguity: "indescribable place", "strange place", "unlikely place", "out of place".

Therefore, atopic is not a non-place. Atopic is not a new type of space, nor a simulacrum territory, nor can it be defined entirely as a post-territoriality in the sense of overcoming the physical and geographical forms of space. It would be better to define it as replacing them with a digital and transorganic information form, whose constituent elements are digital information technologies, information ecosystems, elaborated by geographic and territorial information systems, ecological networks of biodiversity and living ecosystems, related through sensors, the physical and material part of the space, crossed by information circuits and digital networks. Atopic dwelling is thus configured as the transient and fluid hybridization of bodies, technologies, biodiversity, physical landscapes, data, information flows, and connected devices and as the advent of a new type of ecosystem, neither organic, nor inorganic, nor static, nor delineable, but informative and material at the same time (DI FELICE, 2009).

6 For the concept of formant form, check L. Pareyson and, above all, his student M. Perniola in *L'estetica del novecento*. Bologna: Il Mulino, 1997.

FIGURE 1 – CONNECTIVE ECOSYSTEM



SOURCE: By Schlemmer (2020).

What problems and challenges do this planetary connection and the inhabiting networks pose for education?

Are you online or offline? The new planetary connection and inhabiting networks, as discussed above, make it even more evident that if this frontier has not yet disappeared, it is becoming more diffuse, since we are moving, often simultaneously, in a hybrid of spaces (places), moments (time), technologies, ways of being present and cultures. Where are you? You are OnLIFE (FLORIDI, 2015), in a connective living and coexistence that is becoming a network.

It is in this connective movement, in which digital transformations are hybridizing with different ways of life, places, and times, entities, that we are weaving a new social, reticular, co-engendered, atopic, from which a new, hyperconnected reality emerges. A reality marked by defined changes in different sectors of society, from life in society, driving the emergence of new paradigms, models, communication processes, ways of relating, being in the world. The economic context, of work, of education, is changing rapidly, requiring disruptive dislocations from us.

In the field of Education, in the time of Covid-19, teachers, students, managers, and parents, are quickly needing to make use of different digital technologies (DT), in a network, to continue enabling the teaching and learning processes, which poses a significant challenge for those who have not developed networked digital literacy. This literacy, which implies the appropriation of digital and online environments and platforms, which enhance education.

From a physical, mediated, expanded, digitally enriched face-to-face education, the teaching and learning processes can develop in a continuous hybrid until what we know today as Online Education. However, DT itself does not represent innovation in education, since it can be used only as a novelty, to transpose and reproduce practices, methodologies, curricula, and courses. The innovation we need in education goes beyond the use and appropriation of DT, it is the result of a process of coupling, co-engendering between the human, different entities, including DT and the logic of networks, which makes it possible to significantly transform the way of thinking and doing education, causing its transformation.

Such transformation determines the transition from the form of frontal and analog learning architectures to reticular and digital dimensions. The digitalization of the world and the widespread connection make it possible to build networks and interacting connective architectures, in which learning comes to be understood, based on an ecosystemic logic in which human actors and diverse entities (which digitization gave voice) dialogue and, in a process of interdependence, they build an intelligent ecology. From this context, a new relational, ecological culture emerges, linked to sustainability indicators and criteria, which allows us to talk about an OnLIFE Education, in a hyperconnected reality.

The problematic

The restrictions imposed by the Covid-19 pandemic led many Basic Education and higher education institutions to suspend their activities, while others chose to continue to develop the teaching and learning processes through digital media, in a network. The arguments that justify one or another decision are of different natures, from the lack of digital technological structure and access to the network by students and teachers, the lack of teachers' digital skills, the impossibility of carrying out laboratory practices, even those who advocate for the right to education and the need to continue providing this service to society so that the effects of this crisis are not yet greater for the future of nations.

In educational institutions that have decided to continue to develop the processes of teaching and learning by digital means, in a network, teachers and students are having to make use of these DT, albeit in a light manner, which has resulted in the transposition of classroom teaching to digital media, networked. Thus, we witnessed a race to technologies that enable synchronous communication, with audio and video resources[7] and those that make it possible to record and distribute videos[8], as a solution to continue to "teach classes", in some cases, supported by sending materials and exercise lists by email, or even posted on digital platforms[9], used as a repository. These technologies, in most cases, are being used as a tool, resource, support, from an instrumental perspective, reducing pedagogical methodologies and practices to instructional teaching, resulting from a directive pedagogy. For misinformation, many are calling what is being developed as Distance Education, or Online Education. The transposition of a class designed for the physical face-to-face modality for digital platforms, in-network, does not configure the modality of Distance Education or Online Education. The nature and ownership of space and media change, which requires knowledge of the potential and limits of each digital technology (DT) to allow, due to the connectivity characteristic and the liberation power of the emission pole, to reconfigure pedagogical practices, methodologies, curricula, courses. This requires, therefore, new skills for the development of quality teaching and digital skills that allow the development of technical-didactic-pedagogical fluency, which makes it possible to think about new pedagogies.

However, if, on the one hand, this can be understood as a problem, at first, on the other hand, it represents a significant advance towards understanding this planetary connection and inhabiting networks, which configures the new hyperconnected reality and its potential to transform the education, in an "onlife" Education.

7 Systems that allow webconferencing, such as Zoom, Skype, Google Hangout.
8 Youtube, FlipGrid, among others.
9 Google Drive, OnDrive, Moodle, Canvas, Edmodo, among others.

Interpretative approaches to the human relationship – digital technology in an educational context

According to Moreira and Schlemmer (2020), understanding this hyperconnected reality, resulting from the hybridization of the biological world, the physical world, and the digital world, requires a rethinking of the educational paradigm, of epistemologies and theories, which are unable to cover its complexity, since they limit action only to human beings, in an anthropocentric view of the world. This anthropocentric view is evidenced both by the use approach, comprising DT as a tool, resource, support, to be used by the human (user/consumer), thus generating a naive awareness[10] (PINTO, 2005) about the world it inhabits; as for the appropriation approach, which includes DT as Intelligence Technologies (LÉVY, 1993) and the human as a producer, in a perspective of empowerment and the development of a critical conscience[11] (PINTO, 2005) about the world it inhabits. This second approach, although it seems to indicate an opening, in an ecological perspective, when referring to the technologies of intelligence, again focuses on the human, with the concept of collective intelligence, linked to the human, which acts on the world that serves it.

This leads us to think that the disruptive movement that we need in education, is less oriented by the concept of paradigm[12] and more by the concept of cosmogram (LATOUR, 2016), understood as the design of associations, the distribution of agencies, the movement. This implies new epistemologies, in transforming the anthropocentric and dualistic mental model[13], in reticular designs in which the dualities[14] can emerge. In this context, both the approach to the use of Digital Technologies (DT) and the approach to appropriation, both centered on the human, give rise to a third approach, of coupling, as agency[15],

10 The one produced depending on the use of technology produced by others.

11 Produced in autonomy and technical appropriation, which results in empowerment.

12 Since a paradigm represents a frame, a stabilized environment.

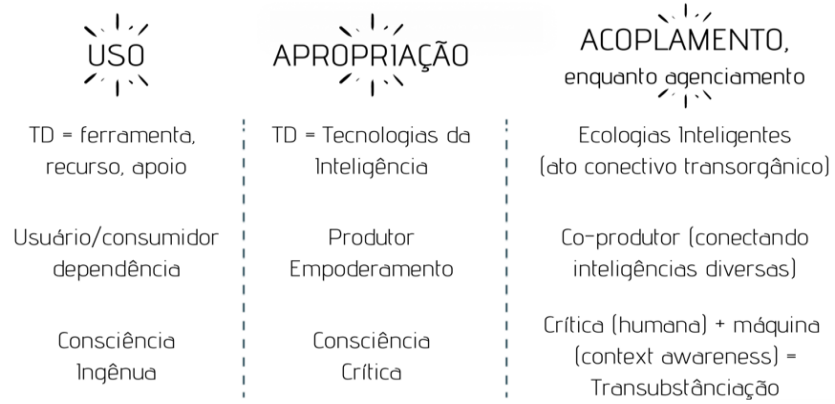
13 Two opposite realities.

14 Which is dual in nature, substance or principle.

15 Relationships between heterogeneous components - physical, biological, digital, social, machinic, historical, etc. - in which there is no determinism or predictability (Guattari & Rolnik, 1986). It does not operate through the interiorization of "things" that are external to it, insofar as such "things" form the compositions that constitute the production of subjectivity.

which operates by reciprocal implication between heterogeneous movements that are constituted in a network, by the trans-organic connective act. In this approach, DT is no longer understood as tools, resources, support, or even as something to be appropriate, within the scope of collective intelligence (LÉVY, 2003), since they not only connect humans, but also biodiversities and intelligence data, causing an intelligent ecology to emerge, of which humans are one of the members, neither the center nor the periphery, but co-producers, connected to different bits of intelligence in a transubstantiation process (DI FELICE, 2017). This approach seems more appropriate to help us understand the ecosystem relations, made possible by the connective act, typical of our time, and provoke the disruptive movement that we need in education.

FIGURE 2 – INTERPRETATIVE APPROACHES TO THE HUMAN-DIGITAL TECHNOLOGY RELATIONSHIP IN EDUCATIONAL CONTEXT



SOURCE: Schlemmer (2020).

The connective act, produced by the ecosystem interactions of a set of diverse actors and interacting, human and non-human (network actors), which when entering into a relationship of connectivity, express the impermanent and creative dimension is proposed by Di Felice, as an alternative to a theory of action.

Next, to better understand the theorization developed above, we present the case of Ana.

Situation: Ana is an experienced teacher in the in-person classroom, transits well in spaces, technologies, methodologies, and pedagogical practices for this modality, and feels comfortable to develop teaching.

Imbalance: Covid-19 appears, schools have been closed and Ana can no longer be physically present in the classroom. How will Ana continue to develop teaching?

Learning: Ana connects to other teachers through social media and, based on her knowledge of teaching, in physical classroom mode, she searches for other technologies, in this case, digital ones, in a network, to develop the already known pedagogical methodologies and practices, that is, it uses DT to reproduce, transpose the way it performed teaching in the physical classroom mode, which configures the understanding of knowledge as representation (This is legitimate, being the first level of meaning and will work, at least for a while, because both Ana and the students are in the paradigm of Education in the in-person classroom mode).

From that moment on, these DT and the network also started to act on Ana and, the more she became familiar with the DT and interacted in a network, connecting with thousands of teachers who are sharing learning and practices, with students, with professionals who research, develop and work with teacher training for online teaching, feel more instigated in their understanding of the limits and potential of each DT, concerning their specific area of knowledge.

Understanding this movement and reflecting on how her learning process is taking place in this new context, Ana feels challenged to think about how these technologies, due to their specific characteristics, can contribute to building new methodologies and practices to better help other people learn (teaching). This allows Ana, in addition to the mechanical use of DT, to appropriate these technologies, meaning them in her learning process and teaching, modifying it (knowledge then begins to operate outside the level of representation, from the perspective of interpretation). We are doing well, very well, we have moved from the level of mechanical use (knowledge as representation) and a naive awareness to the level of appropriation (knowledge as interpretation) and critical awareness. Now we need to move forward.

In this process of appropriation, through the connective act that is constituting a network that connects different human actors (people, including Ana) and non-human (in this case, several digital technologies), mediation processes and multiple pedagogical intermediations emerge, as a result of both human and non-human resources, which act mutually on each other, giving rise to the third approach, that of coupling, as the agency. In this process, actors-networks, ecosystem interactions emerge, which go beyond the understanding of interaction, while the pre-existence of the two separate terms organism/subject/student and medium/object/content (in our case Ana-DT,

in-network) that interact and, from the perspective of attention to pragmatic life, which ensures learning as a solution to problems (in our case, Ana uses/appropriates TD and the network, to teach her classes online or even modify them). It (actors-networks process) comprises an understanding of interaction as co-engineering, in processes of co-creation, co-transformation (sympoiesis), capable of bringing innovation to emerge, thus surpassing the theory of action and dualism, going towards the connective act, the dualities, which instigates the extra attention, the duration, potentiating the inventiveness, impermanent and creative dimension, in a context that is sympoietic.

This new understanding, related to the third approach (explained previously and represented in figure 2), which refers to coupling, as the agency, which operates by reciprocal implication between heterogeneous movements that are constituted in a network, by the transorganic connective act, shows a new understanding that makes it possible to think/design different investigative, development and training contexts. These drawings instigate inventiveness in the scope of teaching and learning, while paths that co-engender in an increasingly atopic dwelling and co-inhabiting, in hybrid contexts. This significantly increases our living condition, which is no longer linked only to geographic spaces (city, home, streets, squares, libraries, schools, universities, classrooms, laboratories, etc.), but also to digitally networked spaces (Virtual Learning Environments - VLE, social media, instant communicators, virtual worlds in 3 dimensions – MDV3D, XReality - XR[16], games, communicative agents, different apps, sensors, markers, wearables, etc.), constituted by the transorganic connective act, which connects diverse intelligence. Thus, we have communicational, interactional informational territories that modify our perception of time, space, presence, among others. Thus, it is possible to understand the digital transformation as a disruptive displacement in space-time of ecosystemic interactions of innovation, which, in the field of education, allows us to speak of an OnLife Education.

16 X Reality (XR) refers to the set of different synthetic realities, produced by computer. It involves Virtual Reality (VR), Mixed Reality (MR), Augmented Reality (AR), Cinematic Reality (CR), among others. The term has been used to refer to experiences mediated by technologies that hybridize digital, biological and physical realities, encompassing a variety of hardware and software that includes sensory interfaces, applications and different networked digital infrastructures, which make it possible to create content, new ways of hybridized reality or hyper-realities, which allow bringing digital objects to the physical world and objects from the physical world to the digital world.

Where the "real" and the "virtual" are (con)fused: elaborations on OnLIFE Education

The term *OnLIFE* refers to this new experience of hyperconnected reality, in which it no longer makes sense to ask whether we are online or offline. It appears in the context of the document "*The Onlife Manifesto*: *Being Human in a Hyperconnected Era*", coordinated by the Italian philosopher Luciano Floridi, as a result of the research and discussions developed by a group of researchers, within the scope of the Onlife Initiative project, which aimed to highlight the challenges that DT represent in different spheres of human life. The central question discussed in the document, which was the basis of the investigation, was explained as follows: What does it mean to be human in a hyperconnected age? The researchers' objective was to study the consequences of the transformations caused by the explosion of digital networks in public policies and to point to the need to rethink concepts such as authorship, privacy, and responsibility (FLORIDI, 2015).

The Onlife Manifesto presents the understanding that DT is not just tools, but "environmental forces" that are changing: a) who we are; b) our interactions/ how we socialize; c) our conception of reality; d) our interactions with reality. According to Passareli (2016), the authors discuss the main contexts of the human condition in the contemporary and hyperconnected world.

The Onlife Manifesto states that hyperconnectivity causes four macro transformations: a) the diffuse distinction between reality and virtuality; b) the diffuse distinction between human, machine, and nature; c) the change from scarce information to abundant information; d) changing the emphasis on individual and binary properties, to the primacy of interactions, processes, and networks.

OnLIFE, where "real" and "virtual" are (combined) is something that encourages us to rethink, essentially, all human activities, and, mainly, Education, starting with the concepts of "real" and "virtual". We understand that what is specific to this new reality, what makes it hyperconnected, is the digital, networked, being the virtual (virtus-power), which emerges from this new reality and, as a power, is not specific to the digital, but it has always existed in human history. On the other hand, digital also has a reality that is not made of an atom but a bit. It is, therefore, a reality of a different nature which, merged with the reality of atom, enhances hyper-reality. The human, like all things, is prolonged in the digital, is coupled and hybridized with it. As a human, it expands, enhances, and externalizes its identity, otherness, its living, and coexistence, in a new hyperconnected reality, OnLIFE.

Considering this scenario, what do we mean by OnLIFE Education, in a hyperconnected reality?

We understand that education takes place through relationships that are established in a network, through connective acts between humans and non-humans. In the case of the non-human actor-DT, these are not reduced to machines that operate according to human instructions but have a machine intelligence (AI), which interacts, acts, and engages with the human, being able to change its status autonomously, through the mining of a multitude of data and the realization of Learning Analytics, which makes it possible to have adaptive and customized environments to different learning needs.

The complexity that implies an understanding between humans, machines, and the environment, cannot be planned, on the other hand, it cannot be left to drift, spontaneously, but rather, it needs to instigate us to rethink the teaching and learning processes in the construction of an OnLIFE Education.

Thus, when we think of Remote In-person Education, Digital Education, Distance Education, Online Education, or even hybrid Education, we turn to Floridi (2015, p.171) who states "The new creates uncertainty, but there are also discoveries and possibilities. There is a continent to live on, it is not just made of mortal dangers, nor a paradise on Earth", and also to Kastrup (2001 p. 21) when he says:

> When being abruptly transported to a new environment, previous habits do not serve and the traveler lives successive experiences of problematization. It is not a question of mere ignorance, but of strangeness and tension between previous knowledge and present experience. When we travel we are forced to live with a certain wandering, to waste time, to explore the environment with eyes attentive to signs and to penetrate new semiotics. We are forced to think, learn and build a new cognitive domain and another way of carrying out activities that were so simple and commonplace that we had forgotten their invented character.

It is interesting to note that the Manifesto begins with the statement that the restrictions and permissions, brought by the digital world, challenge the assumptions of modernity. However, from what we are experiencing with Covid-19, we understand that the restrictions and permissions brought by the biological (virus) and physical (urban) world, have also challenged the assumptions of modernity, leading us to question the anthropocentric view, anthropomorphic and dualist that we have of the world and, consequently, of education. In this context, in addition to a theory of action, centered on the subject and which results in an active pedagogy and, consequently, in

methodologies and practices also known as active, we propose the connective act, from Di Felice (2017), produced in the interactions ecosystems between humans and non-humans (network actors). In these, there is no centrality, but a network, which through connectivity connects to other networks, designing an ecosystemic architecture. This instigates us to relational, connective, networked pedagogies, capable of producing inventive, interventional, reticular, and connective methodologies and practices, in an atopic dwelling.

This is the time to build, effectively, an OnLIFE Education, coherent with the technologies of our time and developing pedagogies for this new hyperconnected reality. An OnLIFE Education where there is no dualism between offline and online, and where technologies and communication networks are not seen as mere tools, instruments, or resources, but as environmental forces that enable the emergence of intelligent ecologies, educational ecosystems that affect the way we teach and how we learn.

In this logic, we understand that the moment is propitious to innovate effectively from an educational point of view and not to reproduce methodologies and practices of the face-to-face modality for digital media, in a network, which, in a way, configures distance learning in the 70s, where paper materials, handouts were sent by mail (today material sent by email or posted in VLE, which turns into real repositories) or, still from the 80s, where we sent CDs with audiovisual material, not to mention *TV Escola*, centered on video lessons (today focused on recording and distributing lessons on videos).

We are facing an inventive learning situation, which requires much more than solving problems, it involves problematization, caused by the world, generating imbalances, breakdowns (VARELA; THOMPSON; ROSCH, 2003), which are the cracks in the habitual cognitive flow, forcing us to think. This is the time for the invention of problems. According to Papert (1980, p. 143), "the discovery cannot be prepared; the invention cannot be planned". Perhaps, the word that best suits what we are experiencing is "bricolage", which Papert (1994) borrows from the anthropologist Lévi-Strauss to refer to a methodology for an intellectual activity that has as its principles: use what you have, improvise, turn around. When educational institutions, the management team, teachers, and students challenge themselves to the digital, networked culture, they throw themselves into the unpredictable, the new and start using different TDs, appropriating themselves, joining together, managing themselves with different digital, network platforms, begin to question the very concept of class, of the classroom. This process can favor the emergence of practices, methodologies, and the co-creation of pedagogies and, thus, enable the reinvention of educational institutions, in an educational reality context or hyper-reality increasingly "OnLIFE".

We are experiencing a change in the ecology of learning, a favorable movement for the transition from a school made up of classrooms and classes, to an ecology of data platforms, access, co-production, and content sharing in an interactive way. This requires overcoming the idea of an educational paradigm, thinking about the cosmogram perspective, the network logic that architect all the ecology of learning in an OnLIFE Education process, based on reticular, connective, and atopic epistemologies, in a co-engineering between human and non-human actors, overcoming the anthropocentric perspective.

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