

**GAIA AND UFERSA: A INTERINSTITUTIONAL COLLABORATION FOR  
APPROACH OF TECHNICAL OBJECT AS COMPLEX ENGAGEMENT IN THE  
TREATMENT OF COGNITIVE DISORDERS**

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**Abstract**

In this writing, we present a theoretical network that supports interinstitutional projects developed at both universities University of Santa Cruz do Sul - UNISC and Rural Federal University of the Semi-Arid - UFERSA. It is the analysis of cognitive processes that emerge from the experience of children and young people with developmental disorders in interactions mediated by digital technologies. The Biology of Cognition by Maturana and Varela favor the understanding of how subjects reconfigure cognition in circular movements of maintenance of the organization, while everything transforms itself in affective and cognitive terms. Simondon discusses the connections between the processes of both individualization technique and psychic and collective individuation, which happen as a becoming in which we think the subject that makes himself in the experience of living. The research projects are produced in the interface technology-education-mental health and invite us for experiences in which children and young people with cognitive disorders potentiate cognition, experiences whose emphasis is on careful, on listening and observation and analysis of processes that have to see with the power and devires of the human.

**Keywords:** Cognitive Disorders; Digital Technologies; Psychic and Collective Individuation; Interinstitutional Collaboration

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## 1 INTRODUCTION

The main goal of this writing is to describe the path taken by two universities in order to build their interinstitutional partnership. The first one is UNISC – University of Santa Cruz do Sul, represented by a research group called GAIA, and the second is UFERSA - Universidade Federal Rural do Semi-Árido, represented by a research group called LICTEC (Languages, Cognition and Technologies).

This partnership becomes effective in the path taken by the researchers who compose this group and, even more recently, on the implementation of transdisciplinary field projects which is produced in the interface education-technology-mental health. The circumstances of living in a group of students and researchers from UNISC and UFERSA make the knowledge available for children and young adults who suffer from Cognitive disorders like autism, schizophrenia and/or depression, mental and cognitive disorders; met in spaces where mental health is taken care of and in schools inside the wide range covered by the partner universities. UNISC is a Communitarian University located in the central-eastern mesoregion of the Rio Grande do Sul State and UFERSA is a Federal University located in the western Potiguar region ('Potiguar' being one who comes from Rio Grande do Norte) located in the Rio Grande do Norte state.

The journey of the researchers from IES is intensified, exactly at the moment in which we interact with changes in different fields like mental health and education. Communities assisted with mental health services and their professionals interact with transformations coming from a movement known as “Anti-Manicomial fight”. One of the consequences of this movement lies in the creation of Centers for Psycho-social Attention in Brazil. The main purpose of those institutions is the development of hosting practices for subjects who suffer from a developmental coordination disorder; offering a multidisciplinary care trusting the human capability and going against the isolation lived in mental hospitals years ago and their treatments linked to the perspective of exclusion from social living.

In the education field, professionals and researchers, who are daily involved with learning processes, propose changes in the way of living and working with children and young adults in different perceptual and subjective conditions, strengthening what we call a movement towards the educative inclusion.

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Technologies related to these processes are invented from the results yielded in researches developed in Brazil and abroad. Researchers from different fields build research networks and are engaged in the invention of useful technologies and experiences which may enable expertise. In learning and mental health environments, it is possible to discern and analyze different paths taken by people suffering from cognitive disorders for their learning process.

A common question arises in the reflections of the research groups in the area of operational coherences that result in the creation of this interinstitutional partnership.

- How do children and young adults who suffer from development disorders trigger cognitive processes when working with digital technologies?

The researchers' life makes the connection to the "stranger inside ourselves" – an expression used by de Julia Kristeva (1989) – and presents us with an observation and analysis of cognitive processes, like: individuation, attention, and learning. The becoming of human beings appears in the direct and immediate relations established in sensitive work, education and/or mental health environments.

The research groups GAIA and LICTEC built this interinstitutional partnership aiming to develop tools, making it possible to think and act in a transdisciplinary thematic field, fostering knowledge and learning pathways. We are working together and this is an act of trust in the potential of all people involved in the experience its produces.

Humberto Maturana facilitates our understanding saying that the knowledge emerges from the effect of circular motions sought by curiosity – biology of cognition – and/or pain – biology of love. And here "love" does not mean just feelings, as we usually say, but language systems and the way we coordinate our language behavior. We feel, this way, a common pain when we work in education and mental health environments and, from a point of view of what we do, we notice are able to notice that this environments still black marked by exclusionary practices and social neglect. The living circumstances of children and young adults and the everyday conflicts they experience, require the possibility of walking on new roads.

The research projects shown here were written by researchers from both partner universities, undergraduate, masters or doctoral students, as an extension of the core issue presented previously in the text. Below there are some of the subject areas we are working on:

- The use of digital games to optimize the attention and learning processes in children and young adults who belong to CAPSi<sup>3</sup> Mossoró (Center for Psychosocial Attention in Mossoró);
- Touch technologies and their effects on the learning experience of autistic children;
- The acts of writing of young adults who suffer from Developmental Coordination Disorder when discovering touch technologies;
- Human rights and mental health: the changes in the Brazilian legislation and the Anti-Manicomial fight;
- Knowledge and information management in education and mental health environments.

We interact with many cultural forms of welcoming the different, understandings about how the articulations between technical objects and the configuration within human life happen, and perspectives related to knowledge processes.

The work, here, requires the organization of a theoretical network in order to understand the complex coupling built between the human being and the technologies on cognitive processes.

- Why do we use *understanding* instead of *knowledge*?

During a training course performed by one of the authors of this text in Santiago – Chile, Humberto Maturana explains that *understanding* is different from *knowledge*, as far as understanding is related to the context of the operation – when the connections on action coordination show we know/lived something. Knowledge is comprising the description, while understanding is studying if the context in which the situation happen makes sense. “Philosophy is done whenever we ask about the reason why we are doing something. We don’t ask about *being* – metaphysical, but about *doing* – epistemological turn” (MATURANA, Santiago, Chile, 2005).

We searched, in different projects linked to the work with children and young adults who suffer from cognitive disorders, trying to understand how technologies may potentialize patterns of knowledge and coexistence. In this paper, we will present constructions made and that come from this interinstitutional partnership, theoretical elements which support the actions performed by the groups involved in the research.

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From a formal point of view, the text is organized in three different moments interconnected to each other: we will start with a discussion that makes visible how we understand what happens in the living and knowledge processes, supported by the Biology of Cognition of Humberto Maturana and Francisco Varela (2001a). Shall deserve attention the autopoiesis concepts, structural closure, and conversation network, because they operate directly on the research-intervention. Following, we will bring valuable contributions from Gilbert Simondon (1958; 1989), a scientist we mention as a valuable source in our work. This brilliant physicist and philosopher develops a meticulous analysis about the genesis and the technical objects mode of existence, relating them to the ways of living and acquiring knowledge. The technical objects are designed from the results of several developments in permanent evolution processes. Gilbert Simondon's approach shows we move, in the technical evolution, from a state of artificiality and disarticulation to a complex synergy of the internal components of the object. In a complex perspective, the author clarifies that the relation between thoughts and life is analogue comparing to the relation between the structured technical object and natural environment. Thereby, it enlarges the knowledge we have on the possibility cognition reconfiguration in human inventions which are carried out when technologies are used.

Finally, we will present results from this partnership displaying parts of the ongoing researches, experiences and common projects which potentialize children and young adults' ways of communicating, feeling, knowing and living in conditions of developmental coordination disorders.

## 2 THE INVENTION OF LIFE AND KNOWLEDGE

*The theories arise through what we do, we live.*

(Maturama, course performed em Santiago, Chile, 2005)

*[...] living creatures result from problems, not only adapting themselves, i.e., modifying their relation with the environment (as a machine may do), but modifying themselves, inventing new internal structures, introducing themselves entirely in the axiomatic of vital problems.*

(Simondon, 1958; 2005, p.27 – translation by the authors)

Humberto Maturana and Francisco Varela, biologists and philosophers who dedicated themselves to the construction of the Biology of Cognition, developed many researches favoring a reflection on cognitive processes and ways of life of the human beings. It is important to briefly mention the authors' academic education and work related to the ideas from the Biology of Cognition.

Maturana was born in Santiago, Chile in 14/09/1929. He was a neurobiologist and studied at Liceo Manuel de Salas in 1947 and, right after that, went to the University of Chile where he graduated in medicine. He studied anatomy and neurophysiology at University College London and, in 1959, he obtained a PhD in biology from Harvard University, USA. Together with a scientist named Jerome Lettvin, from the Massachusetts Institute of Technology (MIT), he registered, for the first time, the activity of a direction cell from a sensorial organ. Thus, they could compete for the Nobel Prize in Physiology and Medicine, even though they did not receive the award. In 1960, a very difficult time in Chile, the scientist went back to be an adjunct biology professor for the Faculty of Medicine of the University of Chile. In 1965, he founded, both, the Institute of Sciences and the Faculty of Sciences of the University of Chile. Together with Francisco Varela, in 1970, he created the term Autopoiesis, explaining how living systems close themselves in circular networks of molecular production, in which the molecules produced in their interactions constitute the same network that produced them and specify their limits. Meanwhile, the living beings keep themselves open to the energy and matter flow, as molecular systems. Thus, living beings are machines which differ from others through their capacity for self-development. Since then, Maturana has been developing the Biology of Knowledge. Nowadays, he is dedicated to extension, research and teaching activities at Instituto de Formación Matriztica in Chile.

Francisco Varela was born in Santiago, Chile in 07/09/1946. He died in Paris in 28/05/2001. Varela was a biologist and philosopher, he wrote about living systems and cognition: autonomy and logical models. As a Ph.D. in biology from Harvard University, he wrote, in 1979, *Principles of Biological Autonomy*, one of the basic texts for the Autopoiesis theories. Living in France, he led a research group at the CNRS (Centre National de Recherche Scientifique) inside the Laboratory of Cognitive and Social Neurosciences at the Salpêtrière University Hospital, in Paris. Varela also worked as a professor for École

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Polytechnique (polytechnical school). He developed the enaction concept, saying that knowledge is inseparable from the knowing subject. Subject and world are mutually made up, this way, every cognitive activity inhabits circularity, in which the cognition we are studying cannot be isolated from the structure and experience (embodied mind).

Among so many positions and valuable studies performed by the authors, it is the distinction they make when they say we are living beings constituting ourselves, being immersed in conversational networks, “*linguajando*”.

I believe that the human being is part of the biped primates' history, in which we belong through the origin of human language. The human language originates from a certain intimacy in the daily life, in which our ancestors lived together sharing food, their sensuality, small groups, participation of the males on raising the children, caring for children, in the coordination of the actions that this implies. And there arises the language as a domain of consensual behavior coordination. (MATURANA, 1997, p. 46 – translation by the authors).

Everything we do as human beings, we do in conversations. And what we do not do in conversations, as a matter of fact, we do not do as human beings. (MATURANA, 1999, p. 47 – translation by the authors).

These researchers focused on a key issue: explaining what the living systems have that makes it possible to qualify them as such. Autopoiesis is a concept built to explain the living phenomenon and molecular phenomena and, how molecular organisms work. Human beings live the same molecular dynamics. The expression comes from the Greek language and it means: auto – by itself and poiesis – production, what entails us to think that living is self-developed in living organisms. Autopoiesis refers to the self developed circular dynamics of the living organisms, what distinguishes them from the non-living ones. Life remains through the autopoietic dynamics and congruence to the environment, in such a way the loss of one or another may lead to destructive processes.

Maturana states that it is possible to use the autopoiesis concept in circumstances related to the preservation of living. In order to keep life differentiating itself, it is necessary to keep the autopoiesis and congruence to the environment. The living flow is a drift, so, instead of going against life, it is important to act like a helmsman, who does not control the boat, changing its direction depending on the circumstances it may face (MATURANA; PÖRKSEN, 2004).

The human environment is the one that goes on in the human sphere and implies on the existence of language. When we mention conversational networks, the things that matters

are the processes lived as a mode of relation between human beings – environment. Humberto Maturana and Francisco Varela explained why it is possible to keep thinking on terms of information transmission when we focus on this relation.

As biologists and participants of the second moment of the cybernetic movement, both authors set forth the matter of how living beings maintain their living, as we already mentioned. There is a structural closure when operating living and knowing circumstances. It is like each one of us carried an entire world, a world that may be set as the one we live in. Nothing coming from the outside may directly affect our nervous system, what may explain why we have no direct access to what happen to others. We tried to note operational coherences which are visible in everyday routines, different ways of acting in the language.

We adopted the concept of “structural coupling” that appears in his work, because it helps to understand how the conversational networks are woven, “*linguajando*” in different ways when children and young adults interact with technologies.

The history of structural changes in a certain human being is its ontogeny. In this history every living being starts with an initial structure which conditions the course of its interactions and sets the structural changes they perform in it. At the same time, the living being is born in a certain place, in an environment that forms the surroundings it feels complete and may interact with others, an environment which is full of its own structural dynamics, operationally distinct from the living being one. This is crucial. As observers, we distinguish the unit the living being is and we characterize it as a certain organization. Thereby, we chose to distinguish two structures which will be considered to be mutually independent – living being and environment – and among them there is a necessary structural congruence (otherwise, the unit would disappear. In this structural congruence, an environmental disruption does not show information on the effects it has on a living being. This, by means of its structure, sets the changes that will occur as a response. This interaction is not instructive, because it does not establish which will be its effects [...] the living being is a source of disturbances, but not instructions. (MATURANA; VARELA, 2001a, p. 107-108 – translation by thr authors).

All living beings live a dynamic around the maintenance of living. This is a common organization; perhaps, we humans are equipped with a nervous system and a particular way of organizing our living, in conversational networks. Maturana and Varela point to some explanations on the nervous system dynamics in its relation with the processes occurring in the interaction domain. Again, they make us think about the reason why we are closed to information and, at the same time, open to exchanges and possible disturbances which trigger structural transformations. When Maturana was interviewed by the journalist and biologist



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Bernd Pörksen, for the book “Del ser hal hacer: les origenes de la biologia del conocer”, he says

We can no longer fall back upon those descriptions saying the nervous system is the calculation of the representation of an exterior world and it processes the information it receives from outside to generate, thereafter, the proper conduct and appropriate reaction. The nervous system appears as a structurally determined network with its own operating mode. The changes in it are only induced, but they are not unilaterally determined by the exterior world's traces and characteristics. The same nervous system calculates its own transitions from one state to another.

The ones who share this opinion, in the concept, have to rigorously distinguish between operations happening inside the system and external processes. It also has to understand that for this nervous system there is no inside and outside, but an endless dance of internal correlations in a closed network made of interacting elements. Interior and exterior only exist for the observer, not for the system. (MATURANA; PÖRKSEN, 2004, p. 74 - translation by the authors).

The human living beings can be easily distinguished from the others, because they support their living weaving conversational networks. All elementary distinct shapes and living material from the human being are the result of changes on the conservation of living. When we talk about conversational networks, we talk about a relational place in which we interact and mutually disturb each other.

In this process, there is a structural closure, because nothing coming from outside – what may happen when there are actions from another process, gesture, writing, image, sound, interactive processes – should directly affect our nervous system. Therefore, the relational place occurs at the *in between space*, because the possibility the environment would cause disturbances triggering structural changes in coexistence.

The external agents acting upon us cannot designate the way we live in. Hence, to keep justifying ways of coexistence supported by exclusion thoughts points to the lack of understanding about the way of knowing and creating the world we live in. We were taught to think that there is a world out there we can describe and, this way, reach the truth of the phenomena. Science moves on and breaks this thesis, what produces great responsibility, it is in the knowledge that we create worlds from what we do. Ever since, we validate in communities, logical science or everyday life, the tasks that build what we want to live. The necessities of validation in science and life are what create networks, twists, different projects, operative logics that walk, several times, in different paths.

At this point, it comes in the notion of “the eye of the observer” which takes us to Heinz von Foerster (1996). The objects and phenomena emerge in our language operations.

Things are not in themselves, they appear through operations of distinction. We have simple and composed units.

A simple unit acts on the operation of its properties within the space they define, for example, pens emerge in the operation, not in the object itself. If I throw this object towards someone, it ceases to operate as a pen. A compound unit exists in two different spaces, in the one defined by the properties with which a simple unit appears and the space defined by the properties of its components when these are distinguished. For example, a child receives a plastic ball as a gift and tells his/her parents that he/she really wanted a leather one. The moment we have to explain something is the one where objects and phenomena come forth from before us and, this way, we cannot destroy the other by thinking and/or feeling different. What we can do is to disturb one another in such a way we would commit ourselves to the consequences of our operating/doing activities.

Changes in cultural forms take a long time to take place, but we know we are going to invent the reality we wish to live in with the actions we take every instant.

The concept of autopoiesis, built by Maturana e Varela (2001a), is connected to the ideas woven in previous studies, among which is the one performed by Gilbert Simondon (1989; 1989, 2007). Reading this classic work makes us think about how much it added for the development of innovative perspectives in the most different fields of expertise. His writing recently arrived in our country and they already began to be present in discussions from the educational and health fields.

This scientist discusses operations involved in technical, psychic and collective individualization processes. We noticed some clear pivot points between Simondon's work and Humberto Maturana and Francisco Varela's *Biology of Cognition*. In this paper, we mention some of the connections related to the living beings, when Simondon talks about individualization.

The author says there are two different paths engaged on searching for an individualization process. One of them is the substantialist path. It understands the individual as a living being who presents itself one way or another and, from this point of view, it is important to search the reasons that lead it to action, search for a principle of individuation. The other path is the hilemorfic one, where the individual is seen as engendered because there is a finding between a form and a material. In both cases, the thesis says we have a principle of individuation, not considering the processes which happen during the lifetime. In particular, these paths come forward when, for example, the emphasis in education and/or mental health practices rests on the diagnosis, or even on the spectra that may identify a child as autistic, a Down syndrome carrier, or even other relevant living circumstances. The attention given to the subjects and arising practices

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operate in the logics of the being that *is*. The autopoietic logic on the invention of self, which aims the conservation of living while everything changes, is far away from this substantialist way of thinking.

At this point, Simondon discusses both, conservation and structure, as essential mechanisms for the cognitive processes. They are key concepts to understanding the way of life of living beings.

[...] the only principle we can be guided by is *the one about the conservation of being through transformation*; this conservation exists because of exchanges between structure and operation, proceeding by quantum leaps through successive equilibria. (Simondon, 1958; 2005, p.25 – translation by the authors)

We, living beings, in the living process, are a present that changes continuously. We seek for the conservation of living in continuous change. (Humberto Maturana, Course in Santiago, Chile, 2005).

A system with a determined structure is a system where everything that happens with it, at any particular time, creates a certain structural change at that time. Different from crystals, humans have a changing structure. Continuous structural change with organizational conservation is an invariant in the system.

In this process of human living, structural changes in coexistence refer to a set of language operations. Maturana and Varela indicate that language is related to doings, not symbols. Hence, symbolic is a comment about what we see in the coexistence in coordination of coordination of doings. Language is this intertwining of coordination of coordination of doings and emotions in our everyday living. We call talking the idea of realizing together with others the notion of a doing and an emotion. Maturana says: “The word conversation comes from the connection of two Latin root words, ‘cum’ which means ‘together’, and ‘versare’ which means ‘go round’. This way, the word conversation means, in its origin, ‘go round with others’” (Maturana, 1998, p. 80). For the author, reality and cognition are built through conversation.

An action that shows in gestures, inscriptions, scriptures, images and other ways children and young adults use to communicate allow the observation of a living moment in a conversational network. I.e., different vernaculars are used in a moment, but they belong to a much broader scope, to a relational-emotional space. These doings belong to a cultural moment, to a moment for weaving explanations about the phenomena we distinguish in the living-knowing

process (it may be updated in other moment and it can be part of a conversational network with different characteristics), in other words, living-knowing ways of communicating through digital writing, games, photography, and videos, coordinating coordinations of doings and emotional coordinations. This is an important point in our work, because an experience/language use, performed by children and young adults suffering from developmental coordination disorders, makes it possible the observation of doings which find one another and are able to change the living structure.

The excite we see in children and young adults actions does not involve only feelings, but the coordinations of behavioral coordinations which we perform during the flow of playing/filming/photographing/writing together with the use of new technologies, in other words, the excite feeling falls as stands as the field of relational behaviors that emerge in sensitive environments where children and youth live, learn.

## **2.1 Humberto Maturana and Francisco Varela talk about cognition: the living beings and the objects as machines**

We will resume circumstances of the context in which Maturana and Varela were the first ones to work with, so that we can understand the way they explain the human-machine interface.

Among many theoretical movements of recent decades, we highlight Cybernetics in its second moment, when it questions earlier models in which knowledge is treated as information processing. The first order Cybernetics dealt with its objects of study, by 1943, as devices that transform incoming messages (input) in outbound messages (output). It introduces the notion of feedback, however it does not consider to the internal organization of the knowledge phenomenon. Heinz von Foerster, physicist and philosopher, was Secretary of conferences and, still at a very young age, he brought to the group the importance of breaking with Behaviorism. He opposes the idea of trivial machines, from the stimulus-response type, to the immense wealth of behaviors in a non-trivial machine. What logicians call “finite state automata”. The second phase of the Cyber movement is inaugurated with Heinz von Forster and Ross Ashby’s works, culminating with Humberto Maturana and Francisco Varela’s theories for biological organization, which we are discussing in this writing.

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When bringing the observer's inclusion to the observed system, Heinz von Foerster offers a powerful tool to reflect upon the knowledge phenomena on which we work. Maturana and Varela discuss the living phenomenon in different living things and develop the notion of autopoiesis, as a way of understanding the living organisms that seek incessantly to preserve/conservate their lives, while their constituent structures change. Emphasis is given to internal consistency and autonomy of the object, organism or complex machine, coming up to a point it reduces its relations with the environment to mere nuisances, carriers of information in any case. In the texture of the biology of cognition, these authors clarify that the reality emerges in explaining, in the operating of the subjects who perceive and feel the world, events, ideas and experience.

The language, as already mentioned, is the distinct way of life in humans and, in this way of living; we are capable of a 3rd order operation in language. We can do something and, later, distinguish differences between an experience and a different one. The thought, which implies in dropping certainties in order to observe if what we believed to be valid, remains valid in a different moment of the living-knowing process, it can establish the need for change and, thereby, we may be able to change the course of life when something is not right.

The understanding that every human being is equally intelligent and that he/she shows it in circumstances that enable knowledge, the paths from where he/she learns, implies on a perspective, a way to notice-feel life and knowledge.

The Biology of Cognition takes care of a reflection on living beings –autopoietic organization – and machines which are considered allopoietic. For the authors, living beings are autopoietic and homeostatic machines. All feedback is performed inside of them. They are machines organized as a system of concatenated components production processes, in such a way, they produce components that generate production processes which will produce them over again, through its ongoing interactions and transformations, in addition to constituting the machine itself as a unit in a physical space.

The organization of the machine, as already mentioned, is the variable that remains constant. What is worth noting is that living beings are able to self-reproducing, in this continuous search for the preservation of living.

The experience involving children and young people, producing the most varied inscriptions just by holding technical artifacts, shows that there is a whole cognitive potential enabling the evolution and the learning experience. Workshops that take place in

environments equipped with different technical devices trigger inventive processes of knowledge.

It is important to mention the difference between the machine as an autopoietic system and allopoietic machines, like an automobile, for example. An allopoietic system is dynamic, but not autopoietic, because processes are organized, but not the component production processes that specify automobile as a unit. The processes that happen do not allow the continuous invention of the automobile.

The systemic and complex perspective in understanding the processes of knowledge and subjectivity guides the research we conducted on the interface technologies-education-mental health. Simondon's contribution comes in to compose our work and brings new lights to the experience.

## **2.2 Gilbert Simondon and the technologies in the increase of cognitive processes**

Gilbert Simondon is a physicist and philosopher dedicated to record, in the context of culture, the debate on nature and evolution of technical objects, making a reflection about how, in culture, we understand the relationship between technique, human beings, nature and society. Simondon's work is fundamental in our research, because its complex approach points to a perspective in understanding the cognitive processes. In order to state that technologies can enhance cognitive processes, it is necessary to explain how we understand this interface between humans and technique and, even, structural changes concerning cognitive processes of children and youth suffering from developmental coordination disorders. As the presence of the work of this great scientist is very recent in our country, we will describe here a small cutout of his life story and professional journey.

### **2.2.1 Gilbert Simondon: sensitivity and curiosity in the living circumstances**

*When an individual dies, his activity remains unfinished, and it is possible to say that it will remain unfinished, so that it will replace individual beings capable of revitalizing this active absence, an action and awareness seed.*

(Gilbert Simondon, *L'individuation à la lumière des notions de forme et d'information* – translated by the authors).

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Gilbert Simondon was born in Saint-Etienne, France, in October 2<sup>nd</sup>, 1924 and he worked as an educator and researcher until his death, in 1989. His father, Simondon Hyppolite, was a postal worker and his mother, Nathalie Giraud, was the daughter of farmers. His wife's name was Michele Balan, she was a literature student, as him, with whom he had 7 children.

From a very early age, he expressed curiosity about the way scientific and technological innovations were received by the society. He was a student at the Lycée du Park in Lyon and at the École Normale Supérieure (1944-1948). He became professor at the Lycée Descartes in Tours (1948-1955), where he studied physics and philosophy. Georges Canguilhem, Martial Guérault, and Maurice Merleau-Ponty were some of his teachers and Canguilhem ended up mentoring him in his doctorate thesis, to whom Simondon made a special thanks for his support and studies performed together.

Georges Canguilhem, philosopher and French physicist, was worried about institutionalizing medicine and biology knowledge as sciences, becoming a great friend. He used to lend his personal library to Simondon. For us who work in education and mental health, this meeting is very important, because Canguilhem puts under discussion in society the way we position ourselves and produce the ideas of normal and/or pathological. A society which for centuries has segregated, mistreated, raped subjects due to their perceptual, cognitive or mental conditions. We keep fighting so these circumstances would no longer occur, this is a necessary struggle in science and everyday life. It is worth asking ourselves to what extent we have already modified these forms of existence.

From his youth, Simondon expressed curiosity for technical professions, remaining hours and hours talking to craftsmen. His parents commented about an interesting fact: when walking, Simondon used to carry with him a notepad or some support for writing, because he wanted to jot down notes. A few themes stood out as important, as different mentalities, perceptions, cultural forms, value judgments, forms of spirituality and other ways of living and acting.

The implication with the social issues conducted him to action in a variety of ways. As a teacher, in addition to working in Colleges and universities, he felt he could improve living conditions in prisons, so, every once in a while he taught to prisoners. He also participated in associations that give support for children of unemployed parents. He developed researches

on disaster prevention and safety, industrialization problems, farm workers problems, among others. He was the inventor of the headlights to their automobiles.

He finished his doctorate degree in 1958, becoming a docent of the Faculty of Modern Languages at the University of Poitiers (1960-1963), Modern Languages and Human Sciences at the University of Paris (1963-1969), and Psychology at the University of Paris V (Sorbonne, 1969-1984).

He wrote many articles for the *Cadernos de Pedagogia* and *Cadernos de Psicologia* (Notebooks of Pedagogy and Psychology), proposing methodologies for learning the technical culture. Mental suffering led him to anticipate his retirement.

Why this information is important when we want to weave agreements on relations between the human beings and technologies? A work is performed as a composition of life and knowledge. Here, on these cutouts about Simondon's life, we can understand the strength of his theories about the way of life of human beings in their articulations with inventions and techniques, and with the realities we keep inventing.

### **2.2.2 Technologies and processes of psychic and collective individuation**

Complex approaches such as the ones made by Gilbert Simondon (1958, 1989) lead us to a different way of understanding technology. This brilliant engineer and philosopher explains about the humanity present in the machines invented.

When studying each tool, part and object we find in machines from the mechanologic period, the author notes the relationship between the composition of these parts and the artisan production, and distinguishes each piece as if it was produced in a abstract way, having autonomy for its own functioning. Each piece separately exercising, for example, the function of cooling the engine of a car. Further, we have changes in the forms of technical invention, in which the pieces are thought in order to compose a system, acquiring, in this case, the concreteness on a whole. The cooling system of an engine becomes the result of different pieces that work together.

In this sense, the technical individualization involves the technical object in the implementation process, in other words, the passage from a State of artificiality and disarticulation to a complex synergy of the object's internal components. For Simondon, the



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technical objects are understood as results of various developments in continuous evolution processes, processes which interact with the society's forms of culture and organization.

Thus, in order to make a thorough analysis of the composition and evolution of each object (for example : motors, electronic tubes triodes, pistons, keys), Gilbert Simondon develops the idea of technical individuation, a process of transformation in the technical culture that leads us to the invention of abstract machines – where the components are organized with autonomy in carrying out functions, without interaction between the various components of a technical set - up to the moment of the invention of concrete machines – where the components are organized as a system and, this way, they establish interconnection lines between their elements to give full account of the object's functions.

The object which is only associated to life or thought is not a technical object, but an utensil or appliance. It lacks from internal consistency, because it has no associated means to establishing a recurring causality [...]. (SIMONDON, 1958: 60 – translation made by the authors).

The relationship between thought and life is analogous to the relationship between the structured technical object and the natural environment. The individual technical object is an invented object, i.e. it is produced by a recurring causality game between life and the human thinking. (SIMONDON, 1969: 60 – translation by the authors).

Simondon comes to warn us that the technical individuation, towards the concretization idea, is established and institutes exchanges with space and with the surrounding energy matrix. To exemplify this idea, the author says

The Gramme machine lost its place, within the production of electrical power, for the polyphase switcher [...] the role played by the chimneys within thermodynamics is replaced by the concentration of high-voltage interconnection lines inside the industrial electricity system. (SIMONDON, 1969. p. 68 – translation by the authors).

Simondon discusses the prospects that establish the relationship between human beings and machines, he also alerts to the ways of thinking that reduce the technical object to a using condition. On one hand, the technocracy with fascination that neglects the reflection on the value of technical objects and, on the other hand, the romanticism that situates in the existence of the objects themselves, the responsibility for human problems.

The author considers the technical invention as background and form in the living beings and in the inventive thinking. He resumes Bergson's studies (1979)-concepts such as

invention, *élan vital* – and he suggests that this is a rich path in which we can think about “vital impetus” as knowledge’s driving power, a process that involves inventing new problems and, thus, modify mental schemas in stages of life and knowledge (SIMONDON, 1958; 1989, p. 155).

The unit of the associated technical object has its analogue in the unity of living being; during the invention, this unity of the living being is the coherence of mental schemes obtained on the fact that they exist and are developed in the same being; the ones that are contradictory clash and are reduced. That's because the living being is an individual being that carries the associated mean that he can invent; This ability to condition himself is on the principle of ability to produce objects that affect themselves. What has escaped from the psychologists’ attention, in the analysis of inventive imagination, are not the schemas, shapes, or operations, which are the protruding and embossed elements, but the dynamic background upon which the schemas clash, combine, and participate. (SIMONDON, 1958; 1989, p. 58 – translation of the authors).

When dealing with processes on the idea of becoming human, Simondon states that reality does not precede the individuation itself, here again connections with what was later resumed by Maturana and Varela, when they say reality does not precede the experience and it emerges in the explanation over the subject and/or in the operations performed by the observer.

Gilbert Simondon highlights the contributions made by physics, probability patterns - the atom - the immense empty space - no longer a simple set of electrons, protons and neutrons.

The individuation process must be considered as "partial and relative resolution which manifests itself in a system, sustaining potentials and containing certain incompatibility in relationship to itself" (SIMONDON, 1958; 2005, p. 24). It indicates that it is possible to meet the individual through individuation, instead of individuation from the individual. The invitation he makes through his work is to convince us to no longer seek for the individuation principle, but rather observe individuation processes that take place in the human beings.

The conception of being on which rests this study is as follows: the living being does not have an identity unit, which is that one from the steady state where no transformation is possible; the living being has a transductive unit, in other words, it can be misinformed about itself, overflowing from its core. What we understand as relation or duality of principles is, in fact, propagation of being, which is more than unity and more than identity; becoming is a dimension of being, not what comes from it according to a succession that would be suffered by an originally given and substantial being. Individuation must be taken as the becoming process of the being,

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and not as a being model which would exhaust its meaning. (SIMONDON, 1958; 2005, p. 25 – translation by the authors).

In education and mental health spaces, this perspective implies in, instead of giving emphasis to diagnostics, launching attention to a subject that creates itself. The becoming process of a child, which we will call EM, about which we will discuss later, is no longer taken as someone who "is", but as someone who can do this and ... and ... and .... learn, invent.

[...] the capacity a living being has to disorientate itself, to solve its own issues when disorientated. (SIMONDON, 1958; 2005, p. 25 – translation by the authors).

[...] the becoming process is not a frame in which the living being exists; it is a dimension of the living being, a resolution mode of an initial incompatibility rich in potential. The individuation corresponds to the emergence of phases in the living being which are also its own stages;

The individualization is not a consequence deposited on the threshold of becoming and left isolated, but its own operation if performed. (SIMONDON, 1958; 2005, p. 30 - translation by the authors).

Classical physics and the Cartesian thought brought us a way for thinking and doing things in science: instability and stability, motion and rest, right and wrong. We know, from the advances in scientific explanations that, in psychic and collective individuation process, the issue is the metastability in which is necessary to intervene the idea of potential energy in a system, entropy and information as negentropy. “[...] permanent communication, keeping a metastability, which is the condition of life.” About the psyche and collective, the author says

[...] built by individuations which succeed the vital individuation. The psyche is the pursuit of the vital individuation in a living being, in order to solve its own problems, the living being is obligated to intervene in itself as problem element, by its action, as a subject. (SIMONDON, 1958; 2005, p. 24 – translation by the authors).

By equipping sensitive environments with technical devices, researchers from GAIA and UFERSA invent experiences promoting the observation of cognitive and affective processes. Hereinafter, we will bring some ideas about the experience in which the reconfiguration of oneself and knowledge operates. The researches take place in the form of interviews. We invented an experience that becomes the operate process of children and young people in education and/or mental health spaces. The experiences allow us to write

about events along the way and, from this, we can distinguish gestures, inscriptions and learning, communicating and living methods.

### 3 RECONFIGURING COGNITIVE AND AFFECTIVE PROCESSES: THE DOING PROCESS OF CHILDREN AND YOUNG ADULTS

We highlighted some notes from the field journal we produced in workshops to our analysis and reflection about the initial processes experienced by the young adult we will call EM.

EM enters the room, walks towards the window and takes in hands the ends of a curtain. He tries to bite it. At this point, I come closer. I tell him my name and ask him about his name. No responses. The body moves in this first contact as if EM had not noticed I was there. After repeating, several times, the gesture of taking the ends of the curtain and try to bite them, he looks back, as if he was sensing my presence at his side, but his eyes keep looking to the curtain. He drops the curtain. The other kids are sitting on the chairs. EM sits down on the floor, takes the lid of a small trash can and starts to rotate it. His eyes follow the movement several times. I start thinking about being on the ground, while EM, after a certain time, stands up. He is restless, he sits again on the floor and starts moving his own fingers, playing or moving, as if he was counting. He seems to be playing with his own fingers. He does not even look at the other kids who are exploring their tablets. (Excerpt #1, Karla's field writings, actions performed by the young EM - May 31, 2012).

How to establish a connection with a young man who doesn't seem to realize the space around him, the other teenagers and the research scholars? It is necessary to seek approach paths, ways to get in touch with EM. Deleuze and Guatarri discuss the different connections and the power of the human being, what helps us to think about how to act and live in an environment with this autistic person

The thought is not arborescent, and the brain is not a rooted or branched matter. What we call, unfairly, 'dendrites' do not ensure a connection of neurons in a continuous tissue. The discontinuity of the cells, the role of axons, the functioning of the synapses, synaptic micro-gaps and the jump of each message over these gaps, make the brain a multitude, plunging, in its consistency plan, a system of probabilistic uncertainty, uncertain nervous system (DELEUZE, g.; GUATARRI, f., 1996, p. 25 – translation by the authors).

During this first meeting with EM, we perform a displacement when we feel that we established some sort of knowledge lace during the playing experience

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EM keeps handling and looking at his own fingers. It comes to my mind the idea of playing with him, enter this game. I sit on the floor beside him and repeat his moves; I play with the fingers of one of my hands and, then, I put it before his eyes. He stops, looks to the side, looks at me, brings his finger close to my face. I imagine it is the glasses he is looking at and the habit children have in pulling them, but I am wrong. He touches my face with his fingers, first the tip of my nose and then he gently touched the side of my face, he hugs me. (Excerpt n° 2, Karla's field writings, actions of the young EM - May 31, 2012).

If the living being is autopoietic, to the effect that it produces itself to live, interventions happening on EM's paths and actions can be affecting, disturbing in such a way it could trigger processes, cognitive transformations. In this case, it is important to work with emergencies, looking at the doing circumstances and following in congruence. That is what we are experiencing here.

We can feel and think about this type of contact, as if EM had noticed the presence of someone else there and had the effort to establish contact in a language he chose. This investment entails a whole emotional action, which we can distinguish in the experience with young people who live in the difference. Maturana says that emotions are perceptible in the language, because all actions "appear and are held in some emotional domain" (Maturana, 2001a, p. 129).

It is through the ideas of trust and welcoming that we tried to bring EM closer to objects and games that could allow him to interact and, in the playing activities, we were able to see slight displacements and transformations.

EM wants to play, for most of the workshop, with the puppets that were already there in the environment, while the other teens were playing with tablets or computer games. A professional of the institution points out something, as if to indicate a growth, the fact that EM was remaining calm with us, a totally new experience for him. I get a tablet from the table and I take it to EM. I invite him to play. He takes the tablet and makes a move as if he would put it in his mouth. I tell him that the object is not edible, but that he can explore it. EM turns around and I just pay attention, so he does not let the tablet fall in the ground. He touches the screen and, then, he gives the device back to me asking to leave, because he makes the gesture of standing up, taking my hand, and heading to the door. (Excerpt # 3, Karla's field writings, actions of the young EM - June 7, 2012).

This young man gets transformed in different ways, because he expresses the joy of being there, he stays longer at the meeting and holds an object different from garbage lid that

used to catch his attention. As well as Derrida (2001) had said, the events can affect us in a sensitive way

However, it is difficult to conceive the idea that in order to something happen without any affection coming in a sensitive, aesthetic way, and even some body or any organic matter. Why organic? Because there is no thought of the event, it seems, without sensitivity, without an aesthetic effect and any presumption of a living organicity. (DERRIDA, 2001, p. 35 – translation by the authors).

Following EM in a new meeting, when some events produce aesthetic effects mentioned by Derrida, events in which we are open minded to not envisaged circumstances in that we are playing with young people.

EM approaches the tablet and makes his first move to touch it by slipping his fingers. He repeats the same movement several times without stopping. He is exploring the tool. After this, I invite him to play and I wonder if he wants to choose a game. This child is still looking at the tablet. I tell him I am going to open the game in which a cat and a dog appear. He seems to be waiting for it. When I open the game, he touches it with his fingers, discovering the reactions of the kitten. His look does not seem to indicate anything, but he happens to be looking at the screen. He starts playing with the tablet once again sliding his fingers back and forth. After several times, he gets up. I leave the tablet on the table. EM wants to leave and I take him to his mother. (Excerpt # 4, Karla's field writings, actions of the young EM - June 14, 2012).

EM enters the room and goes straight to a computer, pointing to the chicken. The screen image refers to a game in which the proposed action is to protect the world from being invaded by chickens. He cheers! We realize that his body moves in front of game scenes, colors and changing effects. (Excerpt n° 5, Karla's field writings, actions of the young EM - July 5, 2012).

EM is able to realize he is playing, moving his eyes towards the interfaces of the computer and/or notebook, the game, the characters, the scene. He is coordinating actions that modify the scenario, advancing game phases. This young man, when he came to us, wondered around the environment, biting the curtain and lying on the floor. His eyes used to look at nowhere and now he moves around looking for objects. EM wants to play and interact.

It is a new workshop and EM heads straight to a computer, clicking on the chicken's game. He starts playing and expressing some concern. He starts pressing the keys very hard, without stopping or giving himself some time. EM starts crying from one moment to another. His restless body was already showing that something was not going well. We approach him, embracing EM and telling him everything is going to be all right. Gradually, he stops crying, goes back to the game, stops one more time and, then, leaves the computer. We were worried

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trying to understand what was happening. Some of our colleagues remain in the workshop with him, while a scholar tries to find EM's mother in the institution's entrance hall. EM's mom says he is showing this sadness during some moments of the last few days. The young man remains in the room, now he is looking for a seat next to one of his colleagues, watching his actions. An important movement: He notices this other colleague and smiles, watching the images appearing on the screen of this other computer.

Gestures, smiles, tears, handling technical artefacts, in order to produce something or play in a sensitive environment, imply in processes that make it visible the complexity of the relationship between the doing and technologies we borrow to keep forward in our paths of knowledge. We have, at this point, the close linkage between the technical object and human becoming processes – emotions and language – modes of living and knowing. On these elements, all involved in individuation processes, Simondon says mentioning here doings in art

Art is not just a contemplation object, but a particular form of action, what is very similar to a sports practice for the ones who use it. The painter feels the ink's viscosity when he mixes it on the palette or spreads it on the canvas; this ink is a bit unctuous and the vibratory tactile sensitivity comes in for the actor that is the artist, particularly when the brush, flat brush or a knife touch the canvas, stretched on the frame and elastic. The feeling is different with watercolor; there is the feeling of a more or less resistance from the brush which places the transparencies, matching the colors. With music, the weight of a piano pedal, the kinetic energy of the game that it commands, in horizontal moves, the piano pedal and the other move from the wool dampers, which vibration makes the strings vibrate and mix the sounds through the free vibration, descending slowly, of the strings played. (SIMONDON, 1998, p. 257 – translation by the authors).

Interactive processes start happening on the experience of a young autistic. Unlike EM, other children and young people suffering from cognitive disorders also give their clues, indicating from where they communicate and learn. In this case, we will bring pictures that freeze living moments in conversational networks, networks which were supported by several technical artifacts:

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EM beginning to play



VI and JU play and advance

A picture can freeze an interaction moment in an environment. Here JU, VI and EM show their involvement in the actions of the game. We are faced with young people who teach the fragility and potency, processes that show themselves at the same time during the human experience.

Simondon talks about the technical set built through the machine's sensitivity to information, what we think it may indicate how processes occur in coupling cognition-technologies. The body moves when clicking on the keys and the characters move to the right and/or left, hands celebrate the happiness of moving to a new phase. Interactive processes happen. Children and young people show happiness and curiosity while watching their colleagues' actions. Learnings occur when young people understand that actions produce changes in digital scenarios, characters move around and stages are overcome.

It is because of the sensitivity machines have to information that a technical set can take place, more than because of an automatism increase. A purely automatic machine, completely closed on itself, in a predetermined operation, could not offer more than summaries results. The machine with high technicality is an open machine, and a set of open machines assumes the man as their permanent organizer, as an alive interpreter of the machines with respect to other ones. (SIMONDON, 1958;1989, p. 11– translation by the authors).

Here, this "man" considered to be a permanent organizer refers to children and young people who suffer from developmental coordination disorders, however, in education and mental health, we can say that the activities with knowledge demand attitudes as: love, care and listening, supporting ways to coordinate actions together with the use of technology.



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The beginning of the contact with JC



Ways to communicate and interact



Autistic children play, learn



How we understand a sensitive environment:  
EM, UV and DG with the researchers

Far from being the watchman for a group of slaves, the man is the permanent organizer of a society of technical objects that need him as musicians need a conductor. The conductor of the Orchestra can only govern the musicians because he interprets, as they do and so intensely as all of them together, the play performed. He calms or rushes the musicians, but he is also calmed and rushed by them; in fact, through him, the Orchestra calms and rushes each musician. He is, for each of them, the moving and current form of the group; he is the mutual interpreter between all the musicians. Then, the main function of the man is to be the coordinator and inventor of all the machines around. He is among the machines that operate with him. (SIMONDON, 1958; 1989, p.11-12– translated by the authors).

The research projects developed through the interinstitutional partnership GAIA-UFERSA, in this field that creates interfaces between education-technologies-mental health, invite to experiments in which children, young people, teams of multidisciplinary professionals and researchers rewrite life and knowledge. We feel like conductors of this Orchestra, often confused with our own life, in transformative interacting experiences with children and young people, musicians who interpret, as intensely as we do, the play performed.

#### 4 FINAL CONSIDERATIONS

We learned from the technical philosopher, Gilbert Simondon (1958; 1989, p. 186), that "the technical objects integrate with the human world they extend" and, the Biology of Cognition by Humberto Maturana and Francisco Varela (2001a), that we distinguish, in the coherences of our operating process in language, worlds we want to live in.

Circumstances such as Autism, schizophrenia, depression, among others that distinguish cognitive disorders, launch new research challenges, because they make us interact with an entire complexity and openness required when we invest in human power. The subjects' paths appear in the writings we made during this research, in the reflection and during the development of studies relevant to the problems of our times. Researchers from GAIA and UFERSA create an interinstitutional partnership which is engaged on the invention of technologies and methodologies capable of potentializing the learning process.

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## GAIA E UFERSA: UMA PARCERIA INTERINSTITUCIONAL PARA ABORDAGEM DO OBJETO TÉCNICO COMO ACOPLAMENTO COMPLEXO NO TRATAMENTO DE TRANSTORNOS COGNITIVOS

### Resumo

Nesta escrita apresentamos uma rede teórica que sustenta projetos interinstitucionais desenvolvidos nas universidades UNISC – Universidade de Santa Cruz do Sul e UFERSA – Universidade Federal Rural do Semi-Árido. Trata-se da análise de processos cognitivos que emergem da experiência de crianças e de jovens com transtornos de desenvolvimento em interações mediadas por tecnologias digitais. A Biologia da Cognição de Maturana e de Varela favorecem o entendimento sobre como os sujeitos reconfiguram a cognição em movimentos circulares de manutenção da organização, enquanto tudo se transforma em termos afetivos e cognitivos. Simondon discute as conexões entre processos de individualização técnica e individuação psíquica e coletiva que acontecem como num devir em que podemos pensar o sujeito que se faz na experiência do viver. Os projetos de pesquisa se produzem na interface educação-tecnologias-saúde mental e convidam para experiências em que crianças e jovens com transtornos cognitivos potencializam a cognição, experiências

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cuya ênfase está no cuidado, na escuta e na observação e análise de processos que tem que ver com a potência e os devires do humano.

**Palavras-chave:** Transtornos Cognitivos; Tecnologias Digitais; Individuação Psíquica e Coletiva; Parceria Interinstitucional

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**GAIA Y UFERSA. UNA COLABORACION INTERINSTITUCIONAL PARA  
ANALISES DEL OBJETO TECNICO COMO ACOPLAMIENTO COMPLEJO EN EL  
TRATAMIENTO DE LOS TRANSTORNOS COGNITIVOS**

**Resumen**

En el artículo se presenta una red teórica de soporte a proyectos interinstitucionales desarrollados en las universidades UNISC – Universidad de Santa Cruz do Sul y UFERSA – Universidad Federal Rural del Semiárido. Se hace el análisis de los procesos cognitivos que surgen de la experiencia con niños y jóvenes con trastorno cognitivo de desarrollo a partir de interacciones mediadas con tecnologías digitales. La Biología de la Cognición por Maturana y Varela aporta la comprensión de cómo los sujetos reconfiguran la cognición en movimientos circulares de manutención de la organización, mientras todo se transforma en términos afectivos y cognitivos. Simondon habla de las conexiones entre el proceso de individualización técnica y individualización psíquica y colectiva que sucede como un devenir donde podemos creer que el sujeto se hace de la experiencia del vivir. Los proyectos de investigación actúan en la interfaz educación-tecnologías-salud mental y invitan a experimentos en los que niños y jóvenes con trastornos cognitivos potencializan su cognición y experiencias, cuya énfasis está en el cuidado, escucha, observación y análisis de los procesos relacionados con las potencialidades y devenires del ser humano.

**Palabras clave:** Trastornos Cognitivos; Tecnologías Digitales; Individuación Psíquica y Colectiva; Colaboración Interinstitucional

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