

**A COMPLEX IDEA OF HUMAN BEING: THE CONTRIBUTION OF NEUROSCIENCE AND ECOLOGICAL SOCIAL AND HUMAN APPROACH IN THE CONSTRUCTION OF COMPETENT AND INCLUSIVE EDUCATIONAL CONTEXT**

**UN'IDEA COMPLESSA DI ESSERE UMANO: IL CONTRIBUTO DELLE NEUROSCIENZE E DELL' APPROCCIO ECOLOGICO SOCIALE ED UMANO, NELLA COSTRUZIONE DI CONTESTI EDUCATIVI COMPETENTI E INCLUSIVI**

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**Abstract**

According to the current lines of contemporary research, the aim of the framework of inclusive education is to respond to the diversity and learning differences of all students, through a different environmental organization for everyone. Brain development is largely a process that depends on experience, in both positive and negative terms (Oliviero, 2017). According to the principle of neuronal plasticity, the brain modifies its structure based on environmental stimuli: in fact, it is environmental and interpersonal experiences that modify our brain structures. In the educational field, it is therefore essential to structure contexts and learning opportunities that generate interest, curiosity, and participation, in heterogeneous environments such as that of today's school, while respecting the development of each student. The contribution of contemporary neuroscience allows today to embody the idea of a complex human being. The relationships and the mediators that are used at school are the signs that students received. That can stimulate the perceptive apparatus and support the development of identity and the relationship between similar (inter-subjectivity). In this work, we will present, through the perspective of the principles of Universal Design for Learning (Rose and Meyer, 2002) how an active, multi-perspective and varied learning, stimulating learning, participation, and development of soft skills, through the design of educational contexts and using different methods that enhance diversity.

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Secondo le attuali linee di ricerca contemporanee, la cornice dell'inclusione educativa si pone la finalità di rispondere alle diversità e differenze di apprendimento dei singoli allievi, attraverso l'organizzazione di ambienti tesi ad accogliere tutti. Lo sviluppo del cervello è in gran parte un processo che dipende dall'esperienza, sia in termini positivi che negativi (Oliviero, 2017). Secondo il principio della plasticità neuronale, il cervello modifica la sua struttura sulla base degli stimoli ambientali: sono infatti le esperienze ambientali e interpersonali che modificano le nostre strutture cerebrali. In campo educativo, è quindi essenziale strutturare contesti e opportunità di apprendimento che generino interesse, curiosità e partecipazione, in ambienti eterogenei come quello della scuola di oggi, ma nel rispetto dello sviluppo di ogni studente. Il contributo delle neuroscienze contemporanee permettono, oggi, di incarnare l'idea di un essere umano complesso. Le relazioni e i mediatori che vengono utilizzati a scuola, sono stimoli che gli studenti ricevono. Questi possono stimolare l'apparato percettivo e sostenere lo sviluppo dell'identità e la relazione tra simili (intersoggettività). In questo lavoro presenteremo, attraverso la prospettiva dei principi di Universal Design (Rose and Meyer, 2002) e della didattica aperta come un apprendimento attivo, multi-prospettico e vario, stimoli apprendimento, partecipazione e sviluppo di soft skills, attraverso la progettazione di contesti educativi e utilizzando metodi diversi che valorizzano l'eterogeneità.

### **Key-words**

Multimodal Approach, UDL, Active Learning, Embedded Learning

Approcci multimodali, UDL, Didattica Aperta, Embedded Learning

### **Introduction**

In today's school is it possible to recognize the uniqueness and human complexity? Today, «making school» means relating the complexity and uniqueness of each individual student with the search for new teaching-learning approaches capable of intertwining this multidimensionality. Neuroscience invites us to consider the human being is in complexity and in connection with the environment (Oliviero 2017, Siegel, 2001; Malaguti 2017; Boncinelli, Calvaruso 2021).

The current heterogeneous classes where there are many students, each with a different profile, recall adopting new methods of teaching (open, flexible, creative, innovative) that respond to the needs and the talents of each pupil. In this paper we shall describe how the use of multimodal approaches and co-teaching could be good strategies to promote inclusive education based on an Ecological approach on inclusive education (Mitchell 2014, 2018; Cottini, 2016; Malaguti, 2017; Morganti, Signorelli, Marsili, 2019). It will be described “a class

project work" referred an interdisciplinary school curriculum, in a third grade of primary school, where it has been experimented the creation of five interactive multimedia lapbooks, about some characters that influenced the history and culture of Italy, through different educational mediators, innovative technologies (Google App for education, Lim, tablet and qr-code), and cooperative and active approach.

### **1. A complex idea of the human being**

In 2019 the whole world was involved in a sudden break due to Covid 19, which radically changed the previous balances. The whole planet, Europe in particular, is not yet out of the pandemic, and it has to manage a geo-political crisis that involves, in a direct way, also the educational and scholastic contexts. In times of crisis, it can be effective to use an approach that intertwines research data with phenomenological analysis, multi-component and multi-factorial able to intersect with the concrete experiences that are determined in the daily lives of citizens. First of all, operating in this historical moment involves a process of knowledge that recognizes the need to consider people's experiences in a wider and more interconnected dimension. Secondly, it is necessary to consider educational contexts as key elements for the education of the new generations, through the different opportunities and ways of learning that they can provide.

The current geopolitical and post-pandemic context has revealed issues already present and at risk of increased margins, which are not positive. The proportion of young people in the 18-24 age group leaving education and training was 13.5 % in 2019. The school drop-out rate remains well above the EU average of 10.2% and is far from the EU 2020 benchmark of 10% (European Commission, 2020). In addition, from international documents, people with disabilities make up about 15% of the world's population, over a billion people, and it is expected to double to 2 billion by 2050 (WHO, 2011); there are about 93-150 million children with disabilities in the world (UNICEF, 2021; Save the Children, 2021). How to respond to this educational emergency?

One of the epistemological foundations of Special Pedagogy, since its origin, corresponds to the construction of processes of humanization. The educational experience of those who work about conditions of marginality, disability, crisis, exclusion, and human vulnerability allows us to observe the event with a different view, but that can become interesting if analyzed to support evolutionary processes and to build useful paths for all. Inclusive education shifts the axis from an individual child's perspective and its limit to a global vision and full participation in real-life contexts. The perspective of inclusive education proposes an Ecological-Social model that

aims to consider multiple dimensions and analysis plans (UNESCO, 2017). It starts from a complex idea of a human being that grows and evolves in relation to its environments of life, where the perspective of improvement, referring to individual instances, is into the reorganization of contexts.

It contemplates precisely the relational aspect, linked to the profile of individual functioning, to the ways in which the person is related to the environment, to the way in which the context is designed and to the way in which its actors' interface with people with disabilities (Malaguti, 2020). According to this approach, to be able to respond to the demands of each person and to the many differences and vulnerabilities, it is necessary to rethink the teaching and learning processes following the *Universal Design for Learning* perspective (CAST, 2011) that underling three fundamental principles of intervention: - provide multiple means of representation; - provide multiple means of action and expression; - provide multiple means of involvement. This complex view, based on the premise that every student is different in his learning process and in his need, allows us to explore new pathways. Furthermore, permit to propose different strategies, methods and materials, always with a plural approach, and to design competent and inclusive educational contexts. An inclusive school needs methodologies and tools based also on scientific evidence (Cottini e Morganti, 2015), which allow it to respond to the needs and demands of learning, to the desires, and to the interests of all.

The contribution of contemporary neuroscience is to understand the learning processes and the brain functioning systems and to discover what are the mechanisms that allow us to be in communication with the other persons, to transmit to them our desires, our beliefs, our intentions and, at the same time, to understand what others do and why they do it (Gallese, 2012), is in line with the complex idea of human being. It should not be considered as only physical - a body - or only as a mental entity and not as the mechanical combination of these two dimensions. The growth of humans is a process: it is not a solid, compact, closed entity but that evolves through a dialectic of being and not being, of presence and absence, of consistency and emptiness. From a neurobiological point of view, the development of the human being depends on some socio-cultural contexts, with a historical genealogy, with a specific reality. In the human being, development is triggered by innate biological components (of genetic origin), but it can only be brought to completion through a long learning process that requires a social-relational context to be implemented (Galanti, Sales, 2017). From this point of view, every human being, even with original learning profiles or developments, can transform his traumatic experiences. The aim of contexts, of those who live there and of those who carry out helping

professions, is to offer many reference points: cultural, affective, relational, social, cognitive, methodological and operative.

In education, the relations and the mediators (people, teaching devices, aids) that are used, are the signals that children receive. They, if oriented and finalized, can stimulate the perceptual apparatus and support the development of identities (the subjectivity, the relationship «me and me», as metaphor) and the relations between similar (intersubjectivity), which are in the cultural and social systems. Human beings, therefore, engage in behaviors to satisfy desires and needs on the authentic dimension of each person. At the same time the events of the world, the culture, the organization of the society, the educational processes, produce effects. When a child can be himself, his feelings and needs, he can develop a mature and complete personality. Experimenting is a process that develops around a series of needs and desires in relation to others. When you create relationships that respect different needs, you taste a well-being that develops trust in the world and respect for himself.

Today, «making school» means relating the complexity and uniqueness of each individual student with the search for new teaching-learning approaches capable of intertwining this multidimensionality. Neuroscience invites us to consider the human being is in complexity and in connection with the environment.

## **2. The construction of competent and inclusive educational contexts**

Brain development is largely a process that depends on experience, in both positive and negative terms (Oliviero, 2017). The brain system develops progressively and our brain is in interaction with the world, this is specialization of neurons in complex areas, which are called neural networks, with thousands and thousands of connections, that change to answer multiple factors in and out of our body. According to the principle of neuronal plasticity (Kandel, 2000) or neuroplasticity, the brain changes its structure on the basis of environmental stimuli: it is in fact the environmental and interpersonal experiences that modify our brain structures; the mind is the product of the interactions between interpersonal experiences and structures and functions of the brain (...) from processes that modulate energy and information within the brain and between different brains (...) is within the interactions between internal neurophysiological processes and interpersonal experiences (Siegel, 2001).

The development of brain structures and functions depends on the ways in which experiences, especially interpersonal relationships, influence and change the genetic maturation programs through the nervous system. In other words, human connections shape the development of the nerve connections that give rise to the mind (Siegel, 2001). The development of each

individual's brain is built in interaction with a social and cultural environment, with a slower maturation than other animal, and in this interaction, the structure of the brain does not remain unchanged, but it is constantly evolving along with other brains and the world (Gallo, 2003). Every single neuron is connected to other neurons creating networks of infinite connections, and in this network the cognitive functions and learning process of everyone is unique, especially if you have a peculiar functioning profile. This process is created by the body-mind-context relationship, and for this, much of the cognitive and linguistic processes are rooted in the perceptual and physical interactions of the human body with the world. The *Embodied Cognition* (Clark, 2008; Varela et al., 1991), designs the mind embedded in a whole organism which is in a wider biological and cultural context (Ling, Clark, Winchester, 2010). It is the mind-brain-body: in the person who is educated or learns, the brain (mental) processes are activated, through the various neuronal circuits, which with the body, perform educational and learning experiences. Therefore, the mind is not something separate from the body, but cognitive processes are based on sensory-motor processes: the environment, people, spaces, objects, open to the relationship with concrete situations, by which develops cognition and learning. Here is recognized the primary importance of lived experience, that is, of a mind, embodied, connected to the environment (embedded), involved in social relations (extended) and active (enacted) (Clark 2008; Varela et al., 1991). This approach, in the field of cognitive sciences of Embodied Cognition (Clark, 2008; Varela, Thompson & Rosch, 1991) considers the corporeity the necessary condition for the development of cognitive processes. According to this vision cognitive activity is always "located", what we do physically and/or emotionally perceive, the structure and dynamics of the environment strongly affect learning. The corporeity can facilitate the building of knowledge, as the active participation of the body during a teaching delivery allows the student to live and deep emotions, understood as an input, totally involving the whole person (Gomez Paloma, 2014).

If our mind is *Embodied* and *Embedded* (Gomez Paloma and Damiani, 2015) it is therefore primary to structure contexts and learning opportunities that generate interest, curiosity and participation, in heterogeneous environments, but respecting the development of the characteristics of each student. Most important is the care of the learning environment and the choice of teaching strategies and appropriate stimuli in a global vision of the person. The complexity of human functioning exhorts us to rethink the learning and teaching process of today's school classes (National Indications, 2012) to permit each student to actively participate. It is no longer sustainable a broken teaching for number of students, in relation to

the specific characteristics and special educational needs, but it is no longer sustainable even a unique and uniform teaching that does not consider the uniqueness of each individual student, the peculiarity and his deep and authentic knowledge (Damiani, Santaniello and Paloma, 2015). The construct of disability concept, understood as an unconditional acceptance of human diversity, shows us how it is necessary to adopt flexibility, collaboration, options, choice and plurality for effective and inclusive teaching, respecting the peculiarities of everyone (D'Alonzo, 2017; Cottini, 2021; Giaconi, 2018; Demo, 2017; Morganti, 2019; Mitchel, 2018).

### **3. A class project work**

In this paragraph, we describe a “class project work” based on the approach previously described. Research results are still under development, but we cite this work as an example of experience, as an operative proposal. In a third class of 25 pupils, in Reggio Emilia, where there is a student with autism spectrum disorder, one with intellectual disability and three pupils with learning disabilities, has been experimented the use of different educational mediators, through new technologies (Google App for education, Lim, tablet and qr-code) in an Italian language teaching activity, during some months of the school year. The main topic was the creation of five interactive multimedia lapbooks, about some famous person of the history and culture of Italy. From the input about a reading of some women who became famous, boys and girls have written what they desire to become in your life, to start in this way from their personal aspirations and motivations. After, through a brainstorming activity, they wished to know some famous Italian people, some of them named the schools of their city. Pupils were divided into workstations, and each group had a famous person and some digital tools, such as a tablet and a laptop. The teacher proposed them to search the information about famous people through a web-search, with the help of a web-question ladder and on sites previously validated by the teacher. After researching, were presented to the children's different types of creative lapbooks. They were asked to build one for each famous person, choosing the necessary information, organizing it into different sections, choosing the best format to create them in a creative way. After the lapbooks, each group presented their work orally to the class. But how to harness the power of technologies in the learning process? Through the Google App for Education, we recorded the oral expositions, and the children used the digital qr-codes with the recording. The qr-codes were assembled in lapbooks, and becoming interactive. The activity was organized through a multimodal approach that allowed full participation. Cooperative learning is, for example, one of the evidence-based strategies in education, effective for creating a truly

inclusive context (Murphy et al. 2005; J. Hattie 2009; Bowman-Perrot et al., 2013; Mitchell, 2008,2014). In cooperative learning, each member of the group, with unique and special characteristics, can contribute to everyone's learning, and everyone can become a resource for others. Through this methodological approach, everyone is valued for what he/she can do, and at the same time finds compensation in their partner for what he/she cannot do. In a cooperative learning environment, everyone has something to give to others and something to receive, and for this reason it allows to create an equal and real inclusive learning, through the creation of a positive interdependence: "positive interdependence" is to be considered achieved when the members of the group understand that the collaborative relationship that unites them is such that individual success cannot exist without collective success, "The failure of the individual is the failure of the group" (Johnson D. W., Johnson R. T., Holubec E. J, 2015). The web-search and the choice of websites were designed so that children could select and organize the information in a simple and successful way. Also, the use of tablets, laptops and LIM was important and effective because they are tools known by children, and for this reason motivational. The selection of information and the reorganization in the lapbooks, without a prototype, allowed children to reflect on the type of different information and actively manipulate them, selecting the best type of "organizer" in the areas of the lapbook. The use of different mediators (active, iconic and symbolic) allows students to answer at the variety and dominance of the cognitive learning of the students. Different materials become students proactive and creators of many materials to show to the other students. (Meyer, Rose, Gordon, 2013). The cooperative approach stems from the idea of seeing the classroom and the school as a laboratory that interacts with local resources, a place where pupils exchange points of view, negotiate meanings, create meaningful and shared experiences. In this view, the laboratory is the best way of working that encourages research and planning, involving pupils in thinking, implementing, evaluating activities lived in a shared with others. With laboratory teaching and active methodology of teaching, the teacher is a learning mediator, to support pupils to discover their own knowledge. In this way the pupil becomes an active builder of their own knowledge, according to their own learning style and using different intelligences (Gardner,1989). Through active, multi-perspective and diversified learning, which uses open and reusable materials, simulations and didactic games, the school wants to put pupils in situations of continuous learning, which allow them to learn to argue their thinking, to correct it, and present it to the others, even through personalized methods. The use of resources and digital tools enriches and integrates teaching methods, motivates and involves students, and stimulates participation and

active learning for the development of life and soft skills. These are the main operations for inclusion. This learning context, flexible and with plural proposals, does not exclude personalized interventions for pupils, which, however, if necessary, will be much simpler to organize, more effective, and if there are possibilities, oriented towards a substantial autonomy in which personalization is no longer a priority (Malaguti, Augenti, 2022). Also, the use of personalized strategies within lapbooks, such as Alternative Augmentative Communication (Constantino, 2012), increases the understanding of the Italian language also for foreign students, becoming a tool of "Special Normality" (Ianes, 2006). The Special Normality means two things: to activate the necessary resources and measures, favoring those closest to normality, and to include in normality, transforming it, those <<active ingredients>> technical and special that make it more successful and that are themselves modified (Ianes and Macchia, 2008; Booth and Ainscow, 2006). The activity was co-designed and shared between the curricular teachers and the teacher of support: the type of the groups, the strategies, the different materials, the technologies according to the needs of each individual pupil, enriched the group. The co-teaching is a crucial dimension for the real inclusion in a classroom. There are many forms of co-teaching, in which roles can be changed (Ghedin, 2013). With two teachers the class can be more easily divided into groups and subgroups, you can be closer to the pupils, didactic and psychological, you can break the barriers of the classroom, and take different spaces to ordinary teaching (Ianes, 2014).

The work and the products made have disciplinary learning objectives, in an interdisciplinary and transdisciplinary perspective (Piaget, 1972), and moreover, they allowed the development of socio-emotional, relational and cognitive skills and competences (Life and Soft Skills, OMS 1992). In the field of education, new approaches and training models that promote a framework of skills and can also be used at the work and can become able students to meet the most challenges of the 21st century (Sterling, 2009; Frisk & Larson, 2011; Jennings and colleagues, 2011; Ferkany & Whyte, 2012). In addition to traditional skills, students will also need completely new skills: broad and interconnectable. Disciplinary knowledge will continue to be important but together with them, it becomes essential to promote a framework of skills that will help young people to face social, professional and human challenges. They are a wide range of skills, including meta-cognitive (critical thinking, creative thinking, learning to learn through experience and self-regulation); socio-emotional (empathy, self-efficacy, flexibility and collaboration, motivation, trust, respect for diversity and cultures); practical and physical skills (the use of new technological devices of information and communication), which are attitudes

and skills that can be used in future life contexts, not least in the world of work. (Giacconi, 2015). In this project, the school community started a reflective process on its professional action and on the good practices for the inclusion, through a reflection to rearrange the contexts and with a training course about inclusion in the next years. So, the complexity and uniqueness of the human being should be addressed through the built of educational, teaching inclusive experiences and new models and trials, overcoming the logic of individualized plan. In this view, policies, organization, governance are decisive to the real realization of these new modalities.

## **Conclusions**

In the last years, different studies and research using the contributions of neuroscience to improve the quality of teaching and learning processes, to support a more inclusive teaching (Contini, Fabbri, Manuzzi, 2006; Rivoltella, 2012; Damiani, 2012; Della Sala, 2016; Geake, 2017; Savia, 2019). In a democratic and participatory school perspective, the challenge is the dialogue between neuroscience and inclusive education based on an ecological approach to rethink the teaching methodologies and tools through a process of interaction with contexts able to respond to the need and desire of all students. Today, speaking about inclusive education in Italy, means to evolve to a process able to improve school community competence to develop teaching and practices process to enhance the individual differences of each pupil, with a purpose to create an experience of socialization and learning for all. Inclusive education is overall planning of learning contexts and a change of teaching methods and learning environments, to respond to each student's interest and their right to a successful educational process. In this view, neuroscience can help to understand the teaching-learning processes and increase reflection on the learning environments. For this reason, today, the management of a heterogeneous class involves a global reorganization of the political, cultural and practical (spaces, materials, methodology, tools) dimensions of the entire community school. The special inclusive pedagogical perspective and the intertwining with neuroscience can give interesting contributions for today's educational complexity and challenges.

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