

# **BODY AND PHYSICAL ACTIVITY: FROM LABORATORY TEACHING TO EMBODIED COGNITION**

## **CORPO E MOVIMENTO: DALLA DIDATTICA LABORATORIALE ALL'EMBODIED COGNITION**

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### **Abstract**

In recent years, more and more studies have underlined the importance of the body in learning processes, giving it a fundamental educational role in teaching. The latest research expands the cultural and pedagogical consideration of the body as a dimension that is not only identifiable with the physical component of the person. In this perspective, corporeity stands for the Human as a whole: the human being is felt, perceived in multiple nuances, sensations, activities, and paths that are explored starting exactly from the body. The first part of this article represents a pedagogical reflection on the current situation, opening spaces for discussion on the importance of experience and pleasure as learning strategies. The focus is then turned to an alternative to the traditional lessons, i.e., laboratory teaching, where the body is actively involved in the teaching-learning process. Finally, the recent theory of Embodied Cognition has highlighted how most cognitive processes occur through body control systems. The embedded knowledge considers the dependence of the cognitive processes on the sensorimotor system as given. The abovementioned debate allows to notice how it is increasingly necessary to focus on the close relationship between perception and action, mind, and body.

Negli ultimi anni, sempre più studi, hanno sottolineato l'importanza del corpo nei processi di apprendimento, attribuendo ad esso un ruolo educativo fondamentale nei percorsi didattici. La ricerca contemporanea amplia la considerazione culturale e pedagogica del corpo come dimensione non identificabile unicamente con la componente fisica della persona. Quest'ultima rappresenta il riflesso di un'integralità della persona che è prima di tutto vissuta, percepita, sentita e riconosciuta in una molteplicità di sfumature, sensazioni, attività e percorsi che vengono esplorate a partire esattamente dal corpo. La prima parte di questo articolo rappresenta una riflessione pedagogica sulla situazione attuale, aprendo spazi di riflessione sull'importanza dell'esperienza e del piacere come strategie apprenditive. Il focus si è, successivamente, rivolto all'analisi della didattica laboratoriale, come valida alternativa alla tradizionale lezione frontale in grado di coinvolgere il corpo nel processo di insegnamento-apprendimento. Infine, la recente teoria dell'Embodied Cognition ha messo in luce come la maggior parte dei processi cognitivi avvenga attraverso i sistemi di controllo del corpo. La conoscenza incorporata, infatti, prevede come assunto la dipendenza dei processi cognitivi dal sistema sensorimotorio. La riflessione svolta permette di notare come sia sempre più necessario concentrarsi sullo stretto rapporto tra percezione e azione, mente e corpo.

### **Key words**

Learning, Physical Activity, Embodied Cognition  
Apprendimento, Attività Motoria, Embodied Cognition

## **Foreword**

Human history, which has always been characterised by philosophical and pedagogical reflection on the cognitive, expressive, emotional, affective, social, and relational dimensions of bodily experience, has developed along a long and discontinuous path.

This path has seen alternating phases of exaltation of the body with periods in which the spiritual or ascetic aspects of human existence have diminished and, in the most extreme cases, denied the body dimension, enclosing it within a dualistic approach characterised by a clear separation between mind and body. This approach has conditioned and still conditions the thinking of generations of scholars. Reflection on this mind-body relationship has opened a debate that has led a large part of philosophy to give greater importance to the spiritual aspect and to consider corporeality as a marginal component (Vitale et. al, 1992).

## **1. Learning by Experience**

In today's society, references to the body have become particularly frequent in a variety of contexts, which raises the question of whether education is also able to reflect an adequate centrality of the body. The interactions between corporeality, sensibility and learning are today registering a change in perspective that sees the body at the centre of renewed attention.

The sensory and motor system is recognised in its educational and didactic value as a tool for the development of cognitive skills that are highly dependent on bodily-kinesthetic experience (Russo, 2011). Although human culture is often abstract and based on written forms of communication, the mind is overly sensitive to visual experiences. This characteristic is often underestimated in teaching and learning, even though visual reality occupies a central place in the first years of life.

Our brain is able to register and process visual information from birth: through visual skills the child has the ability to register information in the form of images, to recognise them and to make associations (Oliverio, 1999). The use of images simplifies the subject's learning process because he/she is naturally fascinated by reading them from the earliest years of life, as can also be seen from his/her deep and daily attention to television images (Catarsi, 1999).

The body contributes to underlining the active role played by the subject in all training and educational processes, up to the proposal of an inactive didactics that highlights the cognitive component of the body and action.

Contemporary research broadens the cultural and pedagogical consideration of the body as a dimension that cannot be identified solely with the physical component of the person. From this point of view, corporeality represents the reflection of the wholeness of the person, which is first and foremost experienced, perceived, felt, recognised in a multiplicity of nuances, sensations, activities, and paths that we explore starting precisely from the body: playing, thinking, expressing emotions, communicating, loving are activities to which we could not give course without the decisive contribution of the body (Casolo et. al, 2005).

In this perspective, talking about education to corporeality means recalling the unitary sense of education committed to achieving self-recognition and self-acceptance starting from the appreciation of the infinite expressions that the body is able to manifest.

## **2. Pleasure of Learning**

The child possesses a natural tendency to explore and learn, largely motivated by curiosity that develops as it discovers a new world. Psychologists speak of curiosity as one of the primary motivations for learning: the brain constantly needs to receive stimuli that activate its nerve cells, shape brain circuits, lubricate them, which is why boredom and lack of stimulation end up numbing us, making us less bright.

Neuroscientists have shown that the presence or absence of stimuli has profound consequences on the structure of the brain, especially during development. Even as children, it is

useful to respond to this need by exploring the world we live in, getting excited about the discoveries we make. However, there is no pleasure without motivation, so children need to be stimulated to enjoy discovery by the environment in which they live, both in the family and at school.

There are several theories about the factors that foster motivation to learn. One of the oldest and most traditional approaches goes back to the Anglo-Saxon empiricist philosophers. According to the empiricists, the senses provide us with a certain image of reality, and a particular sensation can be followed by a particular reaction based on the pleasure or pain it brings: an infant who is stimulated by a food stimulus will later ask for it because it has derived a sensation of pleasure (Barbieri, 2002). This philosophy gave rise to behaviourism.

The behaviourist approach to the motivation to learn, based on the stimulus-response mechanism, is based on the assumption that the learner must be incentivised by appropriate rewards when engaging in desired forms of behaviour (Cacciamani, 2002).

Another approach, the cognitive approach, emphasises the fact that human behaviour is influenced by the way people perceive things and events that happen to them (Neisser, 1976). Hence, people are motivated by numerous physical and psychological forces that push and pull them in different directions. The cognitive approach is linked to the ideas of Jean Piaget, a 20th century Swiss psychologist and biologist, who argued that children are born with a desire to maintain a sense of organisation and balance in their knowledge, so when they come across an experience that is similar to one they already know, they will simply 'assimilate' the new experience to the old one; when, on the other hand, they are confronted with a reality or have an experience that is even partially different from their previous ones, they will be motivated to 'accommodate' or modify their previous interpretations (Piaget, 2000). Motivation to learn thus involves a balance between the old and the new. In this context, the teacher's job is to provide the conditions for the discovery of something that is missing, that contrasts with their way of seeing reality.

Jerome Seymour Bruner, a twentieth-century American psychologist, and other psychologists have proposed veritable 'discovery techniques' which aim to make students seek to learn more about a particular subject and correct their conceptions which, from naïve, become increasingly sophisticated and complex. Teachers must therefore ensure that learners develop an awareness of their own shortcomings and a desire to clarify and fill them (Bruner, 1998).

Abraham Maslow, a twentieth-century American psychologist, made one of the most thorough analyses of the self-directed aspects of motivation based on two fundamental points: the existence of a motivation to growth and a hierarchy of needs. According to Maslow, when individuals have satisfied basic needs, they will feel motivated to satisfy higher growth needs such as self-fulfilment, knowledge, understanding and aesthetics (Oliverio, 1999). In this case motivation does not originate from a lack but from a desire to satisfy higher needs. Other psychologists look at motivation and success from the opposite perspective, according to which the different drive for success that characterises different people can be explained in terms of the need to avoid failure: according to this hypothesis, some people are success-oriented, others are very afraid of failure and are distressed by it.

### **3. The Movement Workshop**

A methodological proposal that has always been present in the school context is the workshop activity. It can be defined as a way of conducting activities using specific methods and tools.

Schools today are required to be flexible, responsive to emerging needs and constantly ready for renewal. The socio-cultural context, values, reference models, learning styles and individual potential make each person different. On the basis of this, it is possible to state that it is necessary to invest in and improve the individual relationship: in laboratory teaching a different and more effective relationship between teacher and learner can be found.

Laboratory teaching, therefore, represents a valid alternative to the traditional frontal lesson: it allows to deal with disciplinary contents in a dynamic and creative environment. The body becomes a fundamental part of teaching. Finally, in order for teaching to be effective, it is necessary to place theoretical knowledge alongside bodily experience, trying to create links between declarative knowledge (knowing) and procedural knowledge (knowing how to do) (Sibilio, 2007). The workshop, understood as a teaching methodology in schools, is based on the combination of thought and action, on group work and on problem solving. The latter is configured as the set of techniques and methodologies needed to analyse a problematic situation in order to identify and implement the best solution. The student is led to reflect autonomously or in collaboration with his companions, on what and how he/she should learn. This makes it essential to focus teaching on bodily-motor experience, which is able to: activate intrinsic needs and motivations, stimulate the creation of new ones, and qualify them as real learning interests. The student who manages to see the body as the main channel of learning and communication acquires knowledge and skills that would otherwise remain inaccessible and transmits emotions and feelings whose display would otherwise be difficult.

The 2007 National Indications represent a significant reference framework for curricular planning and for all teaching activities that need a review of the normative models.

The body is important in the construction phase of one's own image, in the recognition of one's own bodily functions, expressive perceptive abilities and relational skills. The bodily dimension allows children to interact actively with the world around them, to learn to relate to others through their own experiences, to talk about themselves, to express themselves, to interpret and learn. It is in this way that the circular process of body, action and cognition is realised.

#### **4. The Teacher's Role**

The relationship between teacher and student, in the teaching context, confronts the teacher with the need to collect the student's perceptions, thus attributing a meaningful function only to specific presumed professional behaviours.

It is essential that there be coherence between perception and action. The teacher is no longer a mere transmitter of knowledge but an active subject in the school community: he/she has complete freedom to design, research, experiment and innovate the field of action, assuming the professional responsibilities of intervention.

The teacher's profession does not only require knowledge of the contents, the acquisition of methodologies and teaching strategies, but it needs a strong motivational involvement and a deep emotional sensitivity towards the learner. The body and motor activity, from this perspective, represent an excellent vehicle for achievement: working first on oneself and then relating to others, bodily and emotionally, allows one to go beyond what the teaching context allows one to grasp (Gamelli, 2012).

The acquisition by teachers of knowledge and skills enables them to equip themselves with those qualities that are fundamental to fostering a learning environment in which students can truly feel active protagonists of the reality they experience. Learning does not just mean storing concepts, but building awareness of these concepts in the students, and this can only happen by putting their own skills into play. Through movement it is possible to stimulate cognitive activity and obtain stimulation in the other areas in which the personality of an individual is realised: psychomotor skills are necessary both on the part of the teacher and the learner (Sibilio, 2011).

The educational profession is extremely complex and, in order to be carried out adequately, requires consolidated experience and the ability to constantly reflect on one's work. If in the past scholars paid little attention to these relationships, now, thanks to the influence of recent scientific and philosophical theories that characterise embodied cognition, much research is aimed precisely at studying the relationship between body-action-cognitive processes: academic attitudes are changing.

At present, educational training, apart from the experiential field, takes place in the univer-

sity environment. If the didactic perspective is moving more and more towards an embodied viewpoint, it is appropriate for the educator to possess all the epistemological, psycho-pedagogical, and social knowledge of Embodied Cognitive Science, both in theoretical terms but above all in practical terms: it is necessary to insert the teacher in the concrete, in the “embodied” didactic process. In order to acquire a secure professionalism, a close interdependence between study, experimentation and practicality is fundamental: continuous training as a necessary condition for a professional and qualifying preparation of the teacher.

Embodied Cognitive Science is undoubtedly a teaching approach that fully responds to active participation in the construction of conceptual representation and, at the same time, is the best solution for teachers interested in conducting authentic inclusive teaching.

### **5. Physicality in the Classroom**

One aspect to take into account is the physicality of the classroom, “A human body is never given for itself, but in relation to others. Bodies near and far, touching or looking at each other, dancing together, building worlds. Bodies that evoke, reflect feelings and knowledge, tell lived stories and future prefigurations” (Gamelli, 2012).

It is only in a real context, such as a classroom, that bodies experience a real relationship: physical proximity makes communication possible and the identity of each is strongly influenced by the others, by the relationships acted out and experienced, by the signals actually exchanged. Ivano Gamelli, a twentieth-century Italian pedagogue, researcher, and teacher, uses the expression “The body of expressions” to underline the important role that the body has in expressive and communicative dynamics. In this new vision, it is the body that makes expression possible.

It is the body that speaks, that represents. The body tells, tells itself and its own story to whoever is able to pay attention to it. It is important to read and listen to the body of the person next to us and this commitment cannot fail in a classroom, where there are several bodies telling different experiences.

Ellen Esrock, an American university professor of literature, analyses the experience of having one’s body boundaries extended, of feeling immersed in literature, in art. She proposes a bodily reading process that includes breathing, muscular tension and everything related to internal perception: the ‘transomatizations’ (Esrock et al., 2012).

In support of this, Suzanne Keen, an American university lecturer in English, investigates another process in literature: empathy. She uses a model of embodied cognition that considers bodily emotions and attention as the quintessential bodily expression of visual art perception. This work is based on theories of language that have become fundamental to embodied activity studies. Mark Johnson and George Lakoff, American linguists, believe that our bodily experiences are reflected in the metaphors that govern the use of language and concepts in all domains of existence (Lakoff et al., 1999). This thesis was also the basis for investigations by Mark Turner, an American linguist and author, and Gilles Fauconnier, a French linguist and university lecturer, into the structures of narrative and the development of embodied cognitive architectures (Fauconnier et al., 1996).

### **6. About Embodied Cognition**

Until a few years ago, the body was considered as an accessory when dealing with questions of understanding, cognition, and mental processes but, in the last decade, this position has been reversed: the importance of the physical body in cognitive processes has been emphasised. Psychology has emphasised that it is not simply an organic machine, but also a place where all the facts relating to our relationship with the world occur: action, expression, signalling, communication, knowledge (Avalle et al., 2010). In fact, a new theoretical perspective has developed according to which natural language expressions are understood thanks to the reactivation of

brain areas dedicated mainly to perception, movements, and emotions.

This theory maintains that cognition is embodied and depends on bodily characteristics, in particular the perceptual and motor systems. From this perspective, the way one thinks, makes judgements, reasons, constructs knowledge, speaks... also depends on the way one perceives, the actions one performs and the interactions one's body has with its environment (Wilson, 2002). All this has led to the assumption that understanding the meaning of an expression of language is a kind of simulation of the perceptual, motor, and emotional experiences we have previously had.

Numerous experimental evidences have supported this theory, and, at the same time, the need has emerged to enrich the knowledge on the relationship between didactics, corporeity, cognition and action, integrating new concepts that allow the teacher to acquire a new mindset in the teaching methodology.

The basic principle of Embodied Cognition is based on the idea that most cognitive processes take place through the body's control systems. Embodied cognition assumes the dependence of cognitive processes on the sensorimotor system. Susan Hurley, a twentieth-century British university lecturer and academic, developed a theory much discussed by experts in the field, called mental sandwich. This theory argues that classical cognitive science has viewed the mind as a sandwich composed of two low-protein ends, the sensory and motor systems, with the meat, cognitive processes, in the middle. The strategy adopted by scholars has been to throw out the bread and eat the meat: study the cognitive processes and leave out the body. In the light of this approach, perception and action never had any meaning.

With the development of Embodied Cognition, the possibility of allowing the meal to be fully savoured is amplified and both perception and action characterise most cognitive processes: perception and action do not have to be experienced at the moment of representation, but their presence is required. According to the Embodied Cognition theory of Vittorio Gallese, a contemporary Italian neuroscientist and lecturer, the mind dwells in a given body. From this perspective, cognition is dependent on bodily experience and on a body characterised by its particular perceptive and motor capacities (Gallese et al., 1998).

The Embodied perspective makes it possible to overcome the mind-body dualism, considering organisms as beings endowed with body and brain, and cognitive processes based on sense-motor processes. In recent years, moreover, cognition is described as movement and action, it is not only embodied but also situated in a context that strongly determines it: the body is the first context, the first element of determination.

The embodiment perspective holds that mental activity and brain activity can only be understood within the context of bodily activities. Cognition arises from interactions with the world and, for this reason, can be called embodied. Thought is the result of an organism's ability to interact with its environment. Basic behaviours and movements are necessary for the development of more complex cognitive abilities.

An organism develops an understanding of its basic perceptual abilities when it acquires the ability to control its movements and is able to change its position in relation to the environment (Cosentino et al., 2007).

## **6. Mirror neurons**

An important discovery, which gave most impetus to this approach, was that of canonical neurons and mirror neurons, populations of nerve cells located in the premotor cortex and parietal lobe. Until then, these areas had been considered to be superimposed on motor functions and lacking in cognitive functions.

Based on a series of studies conducted over the last twenty years, researchers have discovered, first in the premotor cortex of the monkey and then also in that of man, the existence of two groups of neurons active during the execution of actions. These two groups of premotor neurons are activated even in the absence of any explicit execution of the action. During purely

observational tasks, in particular, the neurons of the first group respond to the vision of the object to which the action could be directed, those of the second group to the observation of another individual performing the same action (Rizzolatti, 2006).

The neurons of the first group are called canonical neurons because since the 1930s it was hypothesized that premotor areas were involved in the transformation of visual information about an object into the motor acts necessary to interact with it; those of the second group are called mirror neurons because they provoke a mirror reaction in the neural system of the observer where an implicit simulation of the observed action takes place. The canonical neurons, beyond their premotor properties, possess the extraordinary characteristic of activating themselves even through the simple observation of objects, independently of any will, need or possibility to interact with them.

This suggests that the sensorimotor system is able to automatically extract information from objects and encode it in terms of potential actions (Caruana et al., 2013).

For the activity of the neurons, the most significant stimuli are of a visual nature and can be traced back to the observation of those actions in which interaction occurs through the hands (grasping, positioning, manipulating an object), or the mouth. The close link between the two types of neuronal responses, visual and motor, seems to indicate that the mere observation of an action performed by others evokes, in the observer's brain, a 'potential motor act' similar to the spontaneous one activated during the organisation and actual execution of that action. The difference lies in the fact that, in one case, it remains at the stage of a potential act, i.e., of "internal motor representation", while in the other, it is translated into a concrete series of movements.

These two groups of neurons, in other words, demonstrate how the representations of perceived events (perceptions) and of events to be performed (intentions) are based on the same motor code; the presence of this code means that knowledge is strongly anchored to the individual bodies that perceive it and that determine its incorporation: deeply linked to the place, space and body that generates it.

Adequate education in corporeality and movement is of considerable importance if the educational pathway is to be defined as effective. Over the years, the Italian school has shown great interest in the science of the body and movement: with the 1991 Guidelines, a great achievement is accomplished thanks to the principle that in the Infancy School the child must: control his or her own static and dynamic balance, develop the ability to organise the space of action in relation to the body, reproduce simple rhythmic structures and acquire an elementary level of action of the body districts.

In the Primary School, attention is focused on the importance of developing sense-perceptual skills for the procedures of entry and analysis of educational stimuli, on the consolidation of static and dynamic motor schemes for the control of the body and movements, on the development of correct relational behaviour and on the acquisition of expressive-communicative skills. In recent years, a series of legislative changes have been implemented in Italy, aimed at enhancing training processes.

These changes have paved the way for a transformation in school policy and a re-evaluation of the educational approach, focusing on motor activities and introducing the field of experience of "The Body and Movement" (Ordinamenti didattici per le attività educative nella scuola materna statale, 1991).

## **7. Emotions Role**

Emotions play a fundamental role in the educational relationship. They make use of the body for their expressiveness. It becomes necessary to recognise one's own emotions in order to orient oneself in reality and to make conscious choices. Moreover, it has been demonstrated that there is a resonance system for emotions that is similar to the motor mirror system. This mechanism, within a relationship, makes it possible to create a shared empathic space where it is possible to evoke, recognise and understand the emotions of others.

All this makes it possible to see how a child is strongly influenced by the way in which the teacher, the parent or whoever acts as his/her guide and model, relates to him/her: educational guides must be aware of their responsibility regarding the state of mind of their students (Blaesi, 2010).

Active observation allows one to constantly grasp all the aspects and nuances of the various situations one experiences on a daily basis, especially when placed in a real context, such as a classroom. This is where mirror neurons come into play. The ability of the mirror system is to quickly understand the essence of what others are doing or saying, ensuring a full understanding of the communicative relationship.

Observation is directed by mirror neurons and allows us to resonate with the interlocutors, thus making it possible to understand the predisposition, the degree of attention, the willingness to listen, the state of mind. Subsequently, we will be able to act in communication in a more appropriate and effective way. With the discovery of mirror neurons, it has been possible to note that all children experience within themselves the moods of the adults with whom they relate, and this immediately gives every adult a great responsibility: to leave an important emotional mark on the child's world.

### **Conclusions**

It seems clear that it is increasingly necessary to focus on the close relationship between perception and action, mind, and body, considering the physiology of the human body as a new way of dealing with emotions and education.

The importance of movement in learning processes and personal development is giving the body a fundamental educational role in teaching. It becomes an active subject of human learning, a meeting point between oneself and the environment.

A body understood as a living expression of personality, emotions, feelings, thoughts, a body as a perceptive opening to the world (embodied), a body through which we know ourselves and others, a body in action that acts and is formed (cognition) (Schilder, 1973).

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