

STUDY BETWEEN NEUROPHYSIOLOGICAL ASPECTS AND REGULATION DOCUMENTS IN PRIMARY SCHOOL IN ITALY

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Abstract

In recent years Italian primary school, as called in the past time elementary school, that goes between 5 years old to 10, has been updated in the ministerial documents relating to the educational activities. At the same time, recent discoveries about the brain have changed the scientific bases on which are based educational psycho-pedagogy theories concerning movement learning on motor control system such as closed loop, open loop and motor imagery. The purpose of this work is to identify into the ministerial documents regarding the educational activities such as aspects of psycho-pedagogy in the field of body and movement research that relates to neurological and scientific discoveries on motor control and movement learning. The method of research is mixed: theoretical-argumentative approach about scientific paradigms regarding the motor learning in the early years of life and historical-documentary one about the ministerial documents relating to the teaching activities. The results did not carry out particular aspects of education and didactics that can be connected to the new neuro-scientific theories and suggest to update them. All ministerial documents published do not provide any reference to recent discoveries related to the theory of movement and to correlate these according to didactics of motor activities. It may be useful to deepen further the study and deliver the results to the governmental Experts for the necessary updates to fill up the vacuum.

Keywords: regulation documents, motor imagery, open loop, closed loop

Introduction

Recently, the neurological and scientific research has placed highlight to the need for links among the different fields of knowledge to explain phenomena difficult to explain if confined only to the exact sciences field. Thus begins a process that starts to break down the wall that rigidly divides the sciences of life and human sciences. Several research methods can be integrated to investigate on the whole about phenomena which may include fields of knowledge completely different such as neurobiology and philosophy to investigate on the theory of mind

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on motor activities or, in this case, between neurophysiology and motor skills teaching. To explain how the mind works only from the organic point of view may be restrictive, the same may hold if you approach the subject only from the philosophical point of view. In the theories of the movement change is big and should correspond with an adjustment in teaching to update the educational theories that relate to the body. The occasion is the new scientific evidences on the brain, this is the discovery of certain nerve cells that are activated when they see, hear or perceive through touch a movement but do not produce actions and movements. These nerve cells are defined mirror neurons for the property of reflecting in the mind the movements of others or of imagining their own standing still. They do not contribute to the practical execution of the movement while being structures appointed to motor nerve but they perceive it. For this reasons it is called motor imagery. They can be seen when they activate, i.e. they discharge the electrical potential and it is possible to highlight thanks to x-ray sophisticated instrumentation of brain-imaging or neuro-imaging such as Positron Emission Tomography (PET), Functional Magnetic Resonance Integrated (fMRI) of Transcranial Magnetic Stimulation (TMS) and Magneto Encephalo Graphy (MEG). This phenomenon happens all the time when the subjects see, hear, feel on the body or inside the body information concerning the movements of others when there is interest in those activities and actions. It has been demonstrated the existence of particular neurons (mirror neurons) that, in the absence of movement, discharge, activate and reflect the motor activities of others around the body. Furthermore, they discharge even when we imagine a movement but we do not run it. It is then defining a new theory of motor control called imagery motor. This opens a new scenario on learning of motor activities for imitation and on teaching based on simulation and demonstration. It means that action and perception occur in the same time and help each other in all phases of movement. Thus, there is also knowledge in the same time without the traditional sequential stages of sensitive afferent or perception, development of the motor idea, motion planning, execution of actions and their feedback (biofeedback). The importance of the playful-motor activities suggests a new way of doing school, which can be carried out only acknowledging the centrality of the person. The preschool is particularly interested in this scientific development for the consequences that may have on the educational activity; applications may influence the mechanisms of acquisition of motor skills and development of motor skills. There may also be learning in other fields of knowledge different from physical education where the relationship among body, movement and learning produces spatial, temporal, sequential, linguistic, expressive and musical learning and so on. These “learnings” are the study of the educational psychology that updates its own scientific paradigms in relation to these discoveries. Embodiment and situatedness are the center of learning in early age, which means embodied and situated cognition is into the phenomena on the body and movement to develop the learning way. However, it is important, to point out some aspects in order to understand better how to take advantage of these discoveries as well as how to avoid an inappropriate use and distorted cultural spreading (Gallese, 2007). Finally, it is important sense-perceptive competencies, the movement in the space and the time and, at least, the body language meant as a communicative-expressive way. These discoveries bring into discussion the theories of motor control that temporally distinguish the afferent perceptive phase from the executive efferent one according to the two more shared scientific paradigms: closed-loop motor control and open-loop motor control. The first provides that the perception is first and then the movement and so constantly in a continuous loop called closed-loop motor control system. Movements are those that are not present in motor memory and are executed with the help of feedback for adjustments and corrections of errors. They are constantly updated through the comparison between what is perceived, called perceptive trace, and what you have in mind, called memory trace. The second is also expected that first is the perception and then the movement but in one or different scheme called open-loop motor control system (Schmidt, 1985). It clarifies some differences about the past other model that is the movements are already present in memory and do not adjust themselves with the comparison and they can't be corrected when the feedback occurs below 200 milliseconds and the brain can't process them and use

them. This theory states that there are in memory a wide range of similar movements among them in a sort of container or register. These patterns are already present at birth but become active in certain circumstances already in a functional manner. The new discoveries about the brain suggest a mixing up of perception/action in a single process where perception and execution are set together without a sequential order and where the knowledge derived from movement is learned in a single process. The aim of this study is to verify if the ministerial documents of the kindergarten there are aspects of psycho-pedagogy and educational applications of any recent neurological and scientific discoveries on mirror neurons and on motor imagery; to help to develop an epistemological and psycho-pedagogical framework including any related educational applications about body and movement; to make an epistemological reflection on the theory of human movement in the educational school environment for preschool activities in connection with the primary school.

The ministerial documents are in temporal order: 1955 Programme for the educational activity in elementary school, 1985 Programme for the educational activity in elementary school, 2004 National Guidelines in the first cycle of the school, 2007 Curriculum Guidelines the first cycle of the school, 2009 Revision of the educational organization regulated directions for the first cycle of the school.

Method

Integration of different types of research into a single model with an ecological approach. Theoretical and argumentative research that analyzes methodological and didactic patterns of motor activities according to the main educational psychology and neurological and physiological theories. Historical and documentary research that analyzes the methodological and teaching contents of physical activities in preschool obtained from ministerial papers. Comparative research that correlates the different models of study of physical activities for children.

Results

In order to understand the results of the study is useful to give a course prior to the period of the analysis of ministerial documents. For a certain period in Italy learning motor activities were characterized by the instrumental use of the body to achieve goals in the military field. The teaching model has been determined by military purposes aimed to develop the quantitative aspects of movement (strength, endurance and speed) to improve performance and aesthetic aspects (body building) to exalt the ego, while neglecting the education of the person through the body and movement. The method chosen to improve performance was a demonstration of the technical gesture and the order to reproduce it faithfully or the administration of heavy workloads; action teaching was the same for all members of the group. The foundations of this theoretical model are to be found in behaviourism school of thought that is the general law. It begins with the external sensory stimulus, command the same for all, it continues with the answer, predetermined, induced and required at all. Everything is constantly repeated in order to consolidate the motor learning. At the same time and in contrast to this theoretical model, it was born a scientific orientation that considers the totality of stimulation, mainly visual, according to a comprehensive approach to its shape. The Gestalt theory or form (from German language), a psychological current that derives its origin from historical necessity in America to meet the limits of the behaviourist theory that unifies the individual behaviour caused by the stimulus. The stimulation becomes total perception, developed and consists of all the sensations and the data

held in memory. Perception is subjective, individual and conditioned by already acquired learning, it replaces the specific command with a request of execution of movement according to an individual process of imitation. Specifically, the teacher demonstrates in the whole the gesture to play and applies for many years the so-called educational "global-analytical-global" theorem. The cognitive orientation claims to the behaviourism the total absence of the importance of innate aspects of the individual and the consequent ability of the subject to effect changes on itself, cancelling the power that the environment exerts on the individual. A dynamic inside the person is projected to the outside, to the surrounding environment to assert the primacy of the individual; then, there was a review on neutrality on the inside and the outside and so appeared three trends. The culture produces effects on learning as if it were a conditioning from which one can't ignore and crystallizes the values in all knowledge (culturalism). The context within which the dynamics is not neutral in the acquisition of knowledge, rather facilitates or inhibits the activity of the mind (contextualism). Knowledge is built on another before and is constantly developed starting from the initial matrix (constructivism).

The environment was thus partially re-evaluated on the actual impact on knowledge. It turns out the absolute centrality of the individual respect to the environment and the priority of the person in the motor activity without control but the teacher does not show but announces a delivery with minimum requirements and does not interfere in the process and the individual separately learns without a specific technique to achieve the objective it has set itself. The teaching model refers to the techniques of teaching workshop (circle time, cooperative learning and role playing). The phenomenology, the orientation of philosophical origin, has for some time, before behaviourism, gestalt theory and cognitivism with its derivations, focused on the function of the interaction body-environment and subject-subject in the mechanisms of learning, as it was already aware of the actual functioning of the perceptive phenomena of specialized nerve cells that are discovered later (mirror neurons). The interpretative key was all aimed at enhancing the body as a receiver of signals to decode and that they contributed to the knowledge that independently formed whatever it was the single channel, the sensory channel, but determined by perception. The discovery of mirror neurons is confirmed by the phenomenology of perception (Iacoboni, 2008) which binds together perception, action and knowledge in a unique process with no beginning and ending, it defines a different scenario in his motion for complete adherence to the phenomenology. Furthermore, the ability of brain to activate the motor neuron cells that do not innervate muscles, they are evidence of functions of the mind affecting the movement and they are only abstract, like any other knowledge that does not take place with the movement.

The document 1955, *Programme for the educational activity in elementary school* is very short and contains a few elements for the harmonic development about behaviourist aspects. It has a double orientation: the first one is orientated to the harmonic development of the body and its natural expression by the guide of the master and the second one to include the complexity of movement to help to develop the child to grow up. There are no elements on motor control system or didactics method to teach the movement as well as the neuro scientific research.

The document 1985, *Programme for the educational activity in elementary school* is longer than the past one and, for the first time, speaks on motor education in a cognitive aspects in several interface of physical education and sport in the developmental process between five years old and ten. It contains a strong appeal for a didactic guided by the free doing and acting and the provision of appropriate learning environments for a rich and extensive stimulation. The field of knowledge is divided by areas and that of body and movement is enhanced as other fields of knowledge. The teacher's role is slightly active tending in some cases to director of operations. Despite this innovation, the document is incomplete about the new discoveries on motor control system and there are no scientific elements on neuroscience applied to movement and the learning process through the body.

The document 2004, *Attachment A – National Guideline for the Programs of studies of the first cycle of education National Guidelines for Personalized Programs of the Educational Activities in the first cycle of education, Specific Learning Objectives, Recommendation to put into practice the National Guidelines for Personalized Programs of the Educational Activities* is a very innovative regulation tool to teach properly to a new discoveries on individual learning process. It takes in light the relation between the teaching and the learning in an *unicum*. It writes in double column, where there is specified knowledge and ability in motor and sports science, as a sort of a new scientific paradigm of physical education and sports in primary school. It is a mere list of objectives to be achieved in the form of motor skills and there is no single reference to teaching. Basically, it refers to the document above and does not refer to any element related to the theories of motor control or to the recent neuro-scientific discoveries.

The document 2007, *The Guidelines for the curriculum of the first cycle of education*, as the last one a large paper where there is written a lot of knowledge and process of motor and sports science in a new vision for this research field. It resumes the contents of the document *Guidelines for primary school* and they are contextualized in a disciplinary process that goes from childhood to the end of the first education cycle. It widens the sense of continuity of teaching action without indicating specific teaching methods. It does not indicate a specific item on motor control and does not address to new neuro-scientific scenarios on movement in the light of the discovery of mirror neurons or the other two motor control system theories. In all the documents there is no cultural basis of theories of motor control and there are no elements of new scientific discoveries about the brain from the motor point of view. The psycho-pedagogical paradigms are totally based on the overall contents on learning generalizing the teaching in all fields of knowledge.

The document 2009, *Revision of the educational organization regulated directions for the first cycle of the school* does not explain the innovation in a new rules, but it postpones to a new experimental study the final revision and does not hint nothing. It recommends to trust in two last documents: 2007, the *Guidelines for the curriculum of the first cycle of education* and 2004, *National Guideline for the Programs of studies of the first cycle of education National Guidelines for Personalized Programs of the Educational Activities in the first cycle of education, Specific Learning Objectives, Recommendation to put into practice the National Guidelines for Personalized Programs of the Educational Activities*.

Thus ultimately, there is no trace of a scientific specificity about body and movement nor there is a cultural content on the theories of motor control.

In conclusion, in these documents there are not elements and/or methods to establish the application of motor control system in its three scientific ways and forms: closed loop, open loop and motor imagery. The big vacuum is the absolute absence of psychological and pedagogical aspects on movement that could have the theoretical aspect of new discoveries.

Discussion

Documents are lacking in cultural references about physical education and this results in a total absence of knowledge of general and specific aspects of human movement, motor control and psychological aspects. The unique and overall formulation of knowledge is useful for the holistic approach to knowledge but it does not realize at all the objective of base knowledge of a field of knowledge. What is needed is a detailed review of the psycho-pedagogical principles at the basis of ministerial documents with the purpose to insert clear links to the theories of motor control and human movement.

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