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ABSTRACT

Bioeducational sciences are part of the evolution occurring within the epistemological framework of pedagogy conceptualised as “incarnated” science, always embedded into historical, social, and cultural contexts. Informed by biology, neurosciences, psychology, and philosophy, bioeducational sciences are employed by pedagogic research to seek the development of the subject in individual and collective spheres.

Le scienze bioeducative possono essere intese come la naturale evoluzione del lungo cammino di trasformazione dell’impianto epistemologico della pedagogia in quanto scienza “incarnata” nei contesti storico-sociali e culturali ai quali in ogni epoca storica, essa ha sempre cercato di fornire delle adeguate risposte teoriche e pratiche, per la promozione dello sviluppo e dell’emancipazione dell’individuo come singolo e come membro attivo di una collettività più ampia.

KEYWORDS

Bioeducational sciences, educability, interculture

Scienze bioeducative, educabilità, intercultura,

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Introduction

Among the numerous fields of interest of pedagogical research, that of bioeducational sciences, situated on the borderline between pedagogy, biological sciences and neuroscience, and traversed by psychology and philosophy, can be configured as one of the most effective in providing adequate answers to the emerging educational problems posed by complex society, multicultural contexts and the digital universe. The main objective of this research approach does, in fact, consist in defining the extent to which biological constraints can affect the regulation of information acquisition processes and the consequent construction and management of knowledge, bearing in mind both the person's great brain plasticity (from which the concept of educability derives) and the relationship of synergic interaction uniting the individual and the environment.

«Bioeducational sciences configure the subject of training according to interpretative models which, while always making reference to neurosciences, extend further than these and recognise 'the mind' even beyond its neurophysiological justification traced in the neural bases [...]. This analysis perspective radically changes our reflection on training and brings out substantially new traits, first of all because it re-establishes the dimensions of learning and training by favouring a critical and transformative learning process which involves the totality of the individual in his or her subjectivity and in his or her ways of relating to contexts [...]. Cognitive and metacognitive studies have contributed to enhancing research into training issues and have led to an awareness of the need to focus on teaching/learning paths and to conceive didactic strategies along the lines of boosting individual capacities to make free choices, to choose directions and self-direct oneself so as to opt for original solutions [...]. The educational process is called upon to turn itself into a strategy aimed at promoting that selective skill whereby the person selects external stimuli and triggers the diversification of his or her learning structures» (Bruni, 2012, pp.18-20).

For all these reasons, bioeducational sciences are an indispensable support for the construction of educational measures that should also be included in the curricula of teachers and educators.

1.The bioeducational approach and teaching and learning pathways

Bioeducational science guidelines are oriented towards a holistic understanding of human beings, organically inserted in the context to which they belong and identified in the multiplicity of their cognitive, emotional and bodily parts, which are dynamically interwoven with each other, connoting the traits of subjectivity and existential uniqueness.

The evidence of the functional relations between mind and body, reason and feeling, now amply demonstrated also thanks to the contribution of neuroscientific studies, once again interrogates us on the state of interdisciplinary dialogue between the different evolutionary perspectives and on the articulated professional skills which should be part of the cultural background of all teachers, since, as Elisa Frauenfelder has well highlighted:

«in order to study of learning processes, it is therefore essential to know the characteristics of the biological component, and since the brain system is the *conditio sine qua non* of all forms of behaviour, the overriding factor is to know the morphological and functional basis of neuroplasticity, which is a basic property of the brain and one that ensures all possible changes in behaviour' (2011, pp.7-17).

The functional multidimensionality which characterises our lives, our experiences and, above all, our learning designs for each of us a profile of uniqueness which in the educational sphere deserves to be fully understood in order to orient the teaching/learning process in a purely inclusive direction.

Bioeducational sciences provide us with an effective key to interpreting these processes, insofar as they manage to restore to us, in a synergetic dimension, the links between an approach to knowledge which is purely scientific and another which is more pedagogical/humanistic (Frauenfelder, Santoianni, 2004). An awareness of the formidable plasticity of our brain, capable of constantly modifying its structure in response to external stimuli, leads us, as pedagogues and as educators, to seek more innovative strategies and methodologies capable of providing added value to the educational experience. Knowledge of the neurobiological functioning of the attentional, perceptive, psychomotor and memorisation processes does in fact make it possible to define educational and

didactic proposals aimed at and consistent with each individual's development process; moreover, with the affirmation of Embodied Cognitive Science, since the late-1980s, the body has regained a prominent position within cognitive dynamics, as a proactive part of the knowledge process (Varela, Thompson, Rosch, 1991). At last, this perspective fully inserts corporeity into the causal chain of learning, overturns the Cartesian mind/body dualism and opens up new avenues of pedagogical and didactic/methodological research in support of the teaching profession.

Every professional educator should have the tools of knowledge needed to understand that the processes of reworking, generalising, and updating mental schemes are favoured by neuroplasticity; our brain, in fact, never ceases to modify its structure in response to external stimuli and interaction with the environment. This dynamism allows us to learn, throughout life, from our experiences and even to compensate for any cognitive dysfunctionality.

Very interesting in this sense, are the data emerging from the latest OECD international survey on teaching and learning (TALIS); a periodic survey, which is repeated every five years, and has as its main objective to examine the salient aspects of the professional activities of teachers: pedagogical orientations, teaching practices, relations with colleagues and school management, and the ability to draw up a comparative framework of international indicators, necessary to support the different countries in the development of their school policies regarding teaching/learning and on teachers. The survey, which takes place simultaneously in more than 45 countries around the world and is now in its third cycle, provides a valuable opportunity to give voice to the experiences of school leaders and teachers. It is a mine of information which, from an international comparative perspective, feeds back what teachers and school leaders report on their training and work experiences, as well as their concerns about school resources, development and professional training. The data collected by the survey also provide a comparative picture of the school systems in the different participating countries. According to the data collected in the latest 2018 edition, as far as our country is concerned, the overwhelming majority of teachers in schools of all levels express the need to continue to acquire innovative knowledge regarding teaching/learning and new transversal skills to be applied in daily professional practice such as, for example, critical thinking, problem solving, creativity, didactic orientations and ways of communication also suitable for working in multilingual and multicultural contexts. As also clarified in the OECD report, *Teaching for the Future: Effective Classroom Practices To Transform*

Education (2018) , an education system can be considered effective when its teachers use teaching practices that improve the performance of all students, enabling them to develop their personal potential to the full, regardless of language spoken, geographical origin and socio-economic background.

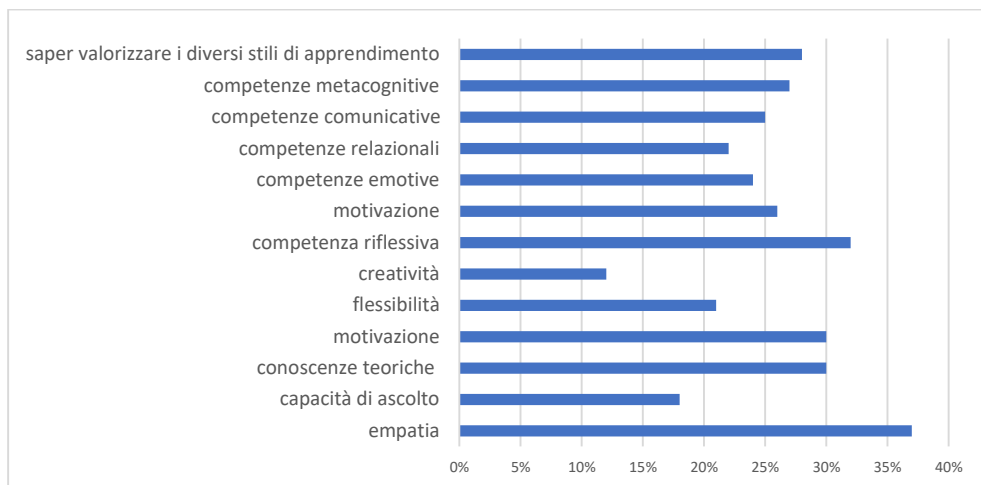
Moreover, for several years now, the issue of teacher training, both initial and in-service, has become one of the priority concerns of the EU Member States; already in the conclusions of the Council and of the meeting of Representatives of Member States Governments of 2007 regarding the upgrading of teaching quality, it was stated that teachers

«play a crucial role in helping learners to fully develop their skills and potential for personal growth and well-being and in ensuring that they acquire the complex range of knowledge and skills they will need as citizens and workers. It is teachers who act as mediators between a rapidly changing world and the learners who are about to become part of it» .

For a further in-depth study of the topics covered, we have developed a self-reflective sheet on the perception of professional skills and teaching/learning practices. This sheet was presented to 214 trainees attending the training course for specialisation in teaching support activities for pupils with disabilities in pre-school, primary school, grade I secondary school and grade II secondary school, organised by the University of Chieti. The future teachers were asked to draw up a sort of “narrative handbook” of the skills, knowledge, experiences, attitudes and abilities that they believe teachers should possess in order to be able to do their job effectively.

In order to analyse the "narrative corpus", a hermeneutic methodological approach was used, the starting point of which was the analysis of frequencies and lexical correspondences carried out with the aid of the T-LAB software, a data analysis program for qualitative research. Through this procedure we were able to identify the main variables that emerged from the text corpus and which helped analyse in more detail the reflections of teachers.

To make the data easier to read, the variables with the highest frequencies have been listed in the graph below.



Graph. 1 – Main professional skills

From the analysis of the data, some significant elements have emerged that make us reflect on the importance of enhancing, within the framework of current teacher and future teacher training, all those aspects that can be traced back to the principles of the bioeducational sciences which contemplate within the education and learning paths, not only the cognitive and technical-procedural aspects of the individual teaching disciplines, but also those linked to emotions, feelings and empathy, which make learners more motivated inasmuch as personal knowledge builders. It cannot escape our analysis that the multidisciplinary perspective broadens our reflection to include an understanding of the phenomenon of empathy. In the first decade of the 20th century, Edith Stein argued that each individual is fully capable of perceiving and understanding the experiences of others as his or her own. "Empathy is the emotional acquisition of the reality of another person's feeling: it thus becomes evident that another person exists and it becomes evident to me that I too am another person. Empathy is then love for that person's structure, it is living in relationship" (Stein, 1986, p.62). It was by no means coincidental therefore that, on 11 January 2022, the Chamber of Deputies approved, practically unanimously, Bill no. 2782 entitled "Provisions on the experimental teaching of emotional intelligence education in schools of all levels", aimed at introducing non-cognitive skills (so-called soft skills) at school and promoting emotional skills in the field of teaching actions. These skills, together with those of a technical-procedural nature, are fundamental for enabling trainees to acquire the necessary abilities to effectively face the challenges posed by complexity, as already highlighted by the WHO in

1993 and subsequently reiterated in the Recommendations of the European Parliament and of the Council of 18 December 2006; we are talking about "a combination of knowledge skills and attitudes appropriate to the context. Key skills are those that everyone needs for personal fulfilment and development, active citizenship, social inclusion and employment". The harmonisation of emotional skills and learning, along with a high level of empathy, positively influences student progress as a whole.

2.The “feeling” category in knowledge construction

Recent research has focused on the relationship between emotional skills and learning (Cooper, 2010; Liew, 2012), highlighting that a high level of empathy positively influences student progress and that, although it can be defined as an innate skill in each of us, its correct activation can be learned and practised in order to respond appropriately to complex situations. (Baron-Cohen S., 2012, p.41). At the same time, the holistic approach that underlies the bioeducational paradigm shows us reality as the outcome of a complex systemic interaction between the parts, a view that also attributes dialogic value to emotions and learning which, in a sort of reciprocal conditioning, are able to support or undermine our relationship with knowledge. Thus, “emotions are not detached from cognitive activity, indeed they concretely influence cognitive processes such as attention, memory and comprehension, they draw attention and resources to what induces them and direct attitude [...]” (Lucangeli, 2019, p. 52).

Dewey also realised that emotions play an active role in knowledge and thought: “The split between the affectional and the cognitive, is probably one of the chief sources of the [...] unendurable strains from which the world is suffering”. (J. Dewey, 1939, Ital. transl. 1968, p. 65).

A few years later, the psychoanalyst Matte Blanco would explicitly attribute a specific cognitive capacity to emotions, at the same time analogous to that of intellectual thought, arguing that: "emotion offers the intellect unlimited possibilities of development [...] emotion of the mother of thinking" (Matte Blanco, 1981, p. 335)

Cognitive emotional theories, developing a tradition of research starting in the 1960s, go even further, assigning to them a clear and explicit cognitive value. This idea is also confirmed by neuroscientific research, as is well illustrated by Immordino-Yang and Damasio's statements: “the relationship between learning

and emotions, the way in which culture shapes learning and ultimately the development of human morality and ethics, [...] are issues of fundamental importance for teachers' (2017, p. 26).

As Margiotto well points out,

«The discoveries of neurophysiology in the last fifteen years, and in particular the identification of mirror neurons by the Parma group directed by Rizzolatti, are progressively replacing the traditional view of cognitive functioning, according to which cognition is the product of the manipulation of symbols (cognitive theories), in favour of the embodiment approach according to which cognition is linked to the body and the role played by the sensorimotor system [...]. Such a paradigm shift cannot be overlooked by educational sciences, given the implication of mirror mechanisms at the level of teaching/learning processes (through imitative capacity, direct assimilation, the role of the motor system, empathy, language, etc.). It follows that if the mind functions and learns differently from what has been hypothesised up to now, i.e., if a large body of scientific results are producing the picture of a mind that is rooted in the body states and neural systems of our brain (embodiment), the formation of the mind - which then corresponds to the personal formation of talents tout court - must also be reconsidered in line with these new assumptions and research perspectives. In other words, the ways in which the teaching/learning process takes place should be rethought in relation to a new understanding of the relationship between perception and action and cognition» (2011, p. 12).

The existence of a neural correlation of an intersubjective nature and its involvement in psychomotor learning and imitative processes is therefore indisputable. Old and new paradigms and models of learning development, integrated with each other in the light of successive contaminations, impose, therefore, the broadening of a teacher's knowledge and, above all, an ability to read and decode scientific evidence and theoretical reflections, always oriented towards reconstructing the unity of knowledge, without losing sight, at the same time, of its intrinsic complexity. This renewal requires a profound reorganisation of the entire school system and the flexible rethinking of the very concept of the multifaceted components of a pupil's education, also contemplating intercultural dialogue, which "proves to be enriching and constructive only if it is made up of interrelations, communication and borrowing in such a way as to provoke a dynamic circulation between meeting places" (Alborea, Izzo, 2002, p.120),

encouraging the development of the capacity to create effective relationships, respecting and enhancing the diehard differences of oneself and others.

Particularly effective in this sense is narrative skill, a pedagogical device that can offer teachers and future teachers spaces for authentic training and self-training. By analysing personal training and professional paths, it is possible to assume a reflective and self-reflective attitude regarding one's own actions and professional knowledge, retracing the salient events that have marked them, the most recurrent feelings that have emerged within the educational process and the attitudes assumed within the various relational dynamics experienced, in relation to oneself, one's colleagues and one's own pupils, effectively combining theoretical assumptions with practical applications. This skill in fact,

«helps focus on reality: looking at things with the eyes of someone who wants to recount them or recover events in order to exercise a narrative function means having a particular outlook, which we could call a "hermeneutic outlook" through an attempt to get to the bottom of things, to their deepest meaning, to look for the essence and essentiality, in the sense of interpretation, [...] And in the sense of understanding [...] This type of outlook is one that grasps changing reality and is therefore the opposite of indifference. In fact, indifference is the inability to see differences and it is this outlook that helps us think about ourselves and about the future» (Batini, Del sarto 2007 pp 40-41, in Dato, 2019, p.109).

Narrative thinking takes the form of a cognitive strategy which not only allows us to reinterpret the surrounding reality, but also to elaborate a more conscious view of ourselves, of others, of our own and others' identities. Unlike logical-scientific thinking, narrative thinking offers the individual the possibility of interacting with the broader socio-cultural context in which he/she finds him/herself having to live.

3.Conclusions

From what has come to light so far, it is clear that the crucial role played by schools must assert itself through interpretative paradigms and meaningful procedures, inspired by the contributions of the bioeducational sciences, and achieve that essential alliance between theory and practice in the contexts of

research-action and functional interweaving. As Elisa Frauenfelder points out, the result is a complex, systemic and interactive epistemological approach that necessarily entails the interaction between a plurality of different perspectives. Particularly important is the contribution that bioeducational sciences offer for the preparation of didactic paths starting from the importance attributed in this perspective to metacognition, (and the meta-reflective management of learning contents); in fact, it is not so much the quantity of notions that an individual possesses which is important, but rather the methods he or she employs in managing the learning contents.

The teaching profession is therefore currently required, among other things, to decline the normative profile and the pupil's training curriculum, personalising them through action plans that go beyond traditional educational approaches, enhancing those centred on the personal characteristics and potential possessed by each pupil, on individual talents, aiming at the promotion of procedural and orientation skills for the life project from a pro-social and intercultural viewpoint.

«Any orientation to learning may be enhanced by the environment on its biological basis, just as, without adequate stimulation, it may not necessarily bear the fruits it had promised. [...] One interpretative key in the definition of learning strategies is the relationship between the learner's psychological framework and the internal logic of the study subjects. Identifying the modalities of encoding and decoding of reality prevailing in an individual means being able to bring each teaching subject closer to the learning preferences of each pupil, an active hub in the content transmission relationship. Furthermore, identifying which strategies and styles are used in preference by each individual can serve to motivate scholastic failures as due to the incompatibility between the students' ways of learning and the characteristics of the learning context» (Frauenfelder, Santoianni, 2002, p. 17).

The innovations to be implemented are many and among them, of utmost importance are teaching methodologies no longer centred on objectives, but rather on an integrated logical structure that proceeds by proficiency networks according to the systemic-relational constructivist paradigm (Bateson, 1979).

The classroom is no longer configured as a simple place for the transmission of knowledge and notions, but rather as a dynamic space of encounter, exchange and negotiation of different points of view that confront and harmonise in an incessant dialogic circularity with the external environment. Also developing those

meta-skills which make it possible to live in the world and contribute actively to its transformation.

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