

## The non-linear potential of didactic action

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*Il potenziale non lineare dell'azione didattica*

### Estratto

Il presente lavoro, partendo da una visione della didattica come sistema complesso ed adattivo, è volto a fornire una prima riflessione sul concetto di *linearità*, da intendersi come possibile interpretazione dei limiti derivanti dalle caratteristiche e dalle relazioni che intercorrono tra gli attori, gli oggetti e gli eventi del processo di insegnamento-apprendimento. Emergono, da un lato, un determinismo causa-effetto nell'azione didattica, dall'altro, una vera e propria negazione della dimensione incarnata e situata dell'azione didattica. Tale dimensione si inserisce nell'ambito di ricerca delle *corporeità didattiche* che indaga le forme corporee dell'agire didattico, le rappresentazioni reali e metaforiche dell'interazione docente-discente-ambiente, configurandosi come l'insieme degli elementi che contribuiscono ad una significazione complessa dell'esperienza didattica in grado di concorrere ad una destrutturazione degli schemi di azione lineari, ripetitivi ed inadeguati ai bisogni emergenti. Al fine di favorire e di promuovere il successo formativo di tutti e di ciascuno, risulta, quindi, necessaria una prospettiva plurale e proteiforme che consenta di cogliere le *morfologie didattiche*, ovvero le *caratteristiche*, gli *spazi*, le *funzioni* e le *potenzialità* dell'azione didattica che rappresentano possibili antagoniste della linearità.

**Parole chiave:** Corporeità didattiche; Linearità; Morfologie didattiche; Postura didattica; Semplicità.

### Abstract

Starting from a perspective that views education as a complex and adaptive system, this paper is aimed at providing a first reflection on the concept of *linearity*, intended as a possible interpretation of the limitations arising from the

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characteristics and the relationships among the actors, the objects and the events that form part of the teaching-learning process. What results is a deterministic vision of teaching and a real negation of the embodied and situated dimension of teaching. This reflection forms part of a branch of educational research that investigates *didactic corporealities* – those aspects of teaching that are manifested in bodily form, real and metaphoric representations of the triadic interaction between the teacher, the student and the environment. This is configured as the set of elements that contribute to a complex meaning of the teaching experience, able to contribute to a deconstruction of linear schemes of action that are repetitive in nature and are inadequate to address the emerging needs of 21<sup>st</sup> Century classrooms. In order to foster and promote the success of all learners, a pluralistic and proteiform perspective is therefore required. This view paves the way to a non-linear form of teaching that is aware of the *didactic morphologies* that are the *characteristics*, the *spaces*, the *functions* and the *potentialities* of action during teaching.

**Keywords:** Didactic corporealities; Linearity; Didactic morphologies; Didactic postures; Simplicity.

### **Towards a definition of *linearity***

The study of non-linearity in didactics, aimed at investigating the teaching-learning process, requires a preliminary analysis of certain themes from an epistemological perspective that is founded on complexity (Gell-Mann, 1995a, 1995b; Le Moigne, 1985; Lewin, 1999; Morin, 1993) and on von Bertalanffy's General Systems Theory (2004). Within this view, linearity in didactics is proposed as a possible interpretation of the limits deriving from the characteristics and the existing relationships among the actors, the objects and the events of such a process, hence perceived as a deterministic relationship that manifests itself in teaching and in the delineation of its spaces and its functions.

If considered as an attribute of teaching, linearity implies a hierarchical and sequential relationship between theory and practice, merely viewing teaching as an intentional product consisting of categories and principles typical of a theoretical model that addresses a pre-established disciplinary knowledge (Bruner, 1995). Such a position appears to be a reductionist view as it denies an array of variables that characterize action: its embodied and situated dimension (Maturana and Varela, 2001), its spaces, contexts and diverse scenarios in which it occurs, and its development and evolution on the basis of human action (Damiano, 2013; Aiello et alii, 2016). In fact, the action of teaching, also in line with Altet's multidimensional model of didactic practices (2002), configures

praxis as an approach which generates theoretical models and as a space where interpretative systems of the teaching-learning process are organized.

In addition, the concept of linearity paves the way to a category that could be defined as a “mould” of teaching. This refers to a *morphological dimension* of didactics that interprets some of the characteristics of action, such as attitudes and behaviours (Sibilio, 2016). Thus, linearity can be considered as a specific behaviour of the teacher which, in the presence of a challenging situation, manifests itself as a series of actions that give life to a specific “*didactic posture*” (Sibilio, 2015). This embodied representation of teaching is part of a wider research area that looks into the embodied meanings of teaching, referred to as *didactic corporealities* that can be defined as real and metaphoric representations of the interaction among the teacher, the student and the environment that are configured as the set of elements that contribute to a complex and multiform meaning of the teaching experience (Sibilio, 2011).

In the teachers’ *didactic postures*, the biocultural dimension (Frauenfelder, 1986, 1994) is projected and their personal epistemology (Hofer, 2001) is manifested. As a consequence, this process leads to a series of possible categories of action, such as:

- *Egocentric linearity* in which teaching is not referred to others but is a reproduction of one’s own learning style (Henson and Borthwick, 1984; Coffield et alii, 2006; Felder and Soloman, 2000). In this case there is no linearity with the students. In fact, the teacher adopts what Berthoz (2015) would define as an “egocentric strategy”, translating theoretical models into action on the basis of one’s own concepts and perceived reference points.
- *Linearity in the perceived teaching outcomes*; in other words the tendency to evaluate one’s teaching on the basis of the results reached by the students as a whole. In fact, these results do not refer to the single student, thus impeding the realization of an action that is aimed at favouring the potential of each student. This should not be the case; one should analyse the individual performance in relation to the subjective characteristics, avoiding generalisations, whether these are positive or negative.

### **Didactic morphologies: possible antagonists of linearity?**

Following this interpretation which focuses on the real and metaphoric embodiment of teaching in both its linear and non-linear forms, the complexity of the teaching-learning processes need to be acknowledged in this specific field of educational research (Atlan, 1985; Davies, 2013; Davis and Sumara, 2009, 2010, 2012; Reigeluth, 2004) which, as previously outlined, requires a multiform and pluralistic perspective. Such a view allows to identify the didactic

morphologies; in other words the *characteristics*, the *spaces*, the *functions* and the *potentialities* of didactics. Within this perspective, didactics can be explicitly and implicitly expressed as a dynamic representation of some possible ways of action and interaction to facilitate and promote the learning experience. In the next section of this paper each of these morphologies will be delineated.

### *Characteristics*

The *characteristics* of teaching can be defined as the combination of elements that are manifested together, thus giving life to a structure that attributes an identity to teaching. *Rhythm*, *style* and *properties* are some of these elements, which are hereafter described.

The first characteristic, *rhythm*, is the temporal dimension of teaching, and can be represented by *frequency*, *speed*, *pause* and *alignment*:

- *Frequency* corresponds to the ability to systematize the different teaching methods in units of time to respond to specific educational needs.
- *Speed* refers to the capacity to slow down action times that precede and prompt interaction.
- *Pause* is the capacity to realise that a student needs a *solution of continuity* while teaching is taking place. A *pause* sheds light on the rhythmic dimension of the teacher; his/her ability to forecast the time necessary to facilitate the teaching-learning process (Rivoltella, 2014). Furthermore, it demonstrates the teacher's capacity to inhibit action, which manifests itself as an opposition to the continuity of an action in relation to the needs emerging during the process of interaction.
- *Alignment* is reflected in the capacity to "tune in" on a temporal level and constitutes an essential component of the interaction. This is tantamount to timing in teaching, or the capacity to modulate *speed* and *pause*, thus constituting the prerequisite of *frequency*.

The *egocentric linearity* in *rhythm* corresponds to a teaching routine in which the teacher, reproducing his/her cognitive style, generates ineffective *linearity in the patterns of action*, as it does not respond to the learners' needs. In these cases, the *rhythm* responds only to the need of *economizing* the teaching action. This results in a constant *homologation* of teaching which in the teaching-learning process demonstrates *blindness in interaction*. Controlling *rhythm*, which is the capacity to modify the temporal dimension of teaching should allow to:

- vary the *frequency* in relation to the emerging needs, taking into account the units of time needed to align teaching paces with those of the students' learning processes;

- increase the *speed* of the teaching interaction according to the learners' demands;
- interrupt or *pause* the teaching interaction, in order to allow time in cases where processing is slower, thus being able to better respect the needs of all learners.

*Style* can be considered as a representation of a teacher's identity with regards to the *preferential* choice of the cognitive strategies utilised when teaching on the basis of one's own teaching abilities. Founded in scientific literature available on the theme (Gardner, 1993; Cornoldi and De Beni, 1993; Cornoldi, De Beni and Gruppo MT, 2001), some dichotomies related to the different cognitive styles can be identified:

- *Global-analytical* style: sustained by the studies on perception (Merleau-Ponty, 1962, 1976; Berthoz, 2009, 2011a, 2011b), this can be observed in a teacher's actions who, in different moments, prefers giving detail over a global approach or vice versa. A teaching style that focuses its action on the global aspects proves useful to decipher the complexity of a situation, through a circular relationship between perception-action-cognition, aware that he/she cannot take advantage of in-depth knowledge on the subjects or the educational environment. An analytical style, on the other hand, requires teaching abilities of selection and specialisation, that are indispensable to perceive in detail one's own Umwelt (von Uexküll and Müller, 2004).
- *Systematic-intuitive* style: expresses the tendency to proceed either in a sequential progressive manner, or, alternatively, to favour a teaching style where the interaction acts as a *cursor* that guides action, starting from global hypotheses that need to be confirmed or questioned during the teaching-learning process.
- *Visual-verbal* style: when teaching, teachers may have a preference to use verbal language rather than visuo-spatial codes, each of which engage different mnemonic and learning processes. The use of metaphors makes the visual and the verbal complementary and syntonic, thus widening the process of giving meaning to what is being learnt (Lakoff and Johnson, 1982).
- *Impulsive-reflective* style: this highlights one's tendency in problem-solving and decision-making processes before and during teaching. The *speed* with which solutions are found and decisions are taken may be short and hence taken hastily (on impulse), or may require longer times which are accompanied by analytical and *predictive* processes (Berthoz, 2003). The reflexive style is slow, accurate and tends to be adaptive to the situation.
- *Field dependent-field independent*: is understood as the ability to discriminate single elements from the whole perceptual field; in didactics this field is represented by the whole educational group-environment-

context. Those who are field independent are efficacious in recognising single elements within the teaching processes and is presumed that they have the capacity to *select* and *specialise*, indispensable abilities during evaluation processes and differentiated instruction. The field-dependent style is characterised by the teacher's capacity to predominantly grasp the general regulatory elements of a system and as a consequence is able to avoid the transformation of the characteristics of the individual elements into disruptions of the teaching interaction.

- *Convergent-divergent* style: this refers to the teacher's capacity to act either by following a linear approach or choosing a divergent approach. In the former case, teaching converges in directions where the strategies chosen are proven and whose results appear predictable. *Diverging* from the norm constitutes expressions of creative thinking (Guilford, 1950; Mednick, 1962; Torrance, 1966; Beaudot, 1976; Ricoeur, 1977; Gardner, 1983; Boden, 1990; Runco and Richards, 1997; Sternberg, 1999), able to tap into the inventory of cognitive resources that the teacher disposes of and are seldom used, or of which the teacher makes use of in different contexts and in different ways.

The implications of *style* can be linked to both an *egocentric linearity* of teaching and a *blindness in the perception of outcomes*. For instance, the global style, if it is the result of egocentric teaching, can lead to a hypertrophy of generalization that underestimates the emerging needs in the interaction. Similarly, systematic teaching, if it is field independent, expresses a blindness in the interaction through which the effectiveness of teaching is derived. Even impulsivity in action can contribute to an *interpretative linearity* of the teacher; i.e. a feedback that fails to capture the real stimulus of the teacher and reiterates exclusively a stimulus-response scheme of action. In addition, the convergent style, which inherently implies a linear approach, is exposed to the risk of blindness with regards to the teacher-pupil interaction.

The *properties*, applied in the field of didactics (Sibilio, 2012a, 2012b, 2014; Aiello and Sibilio, 2013) on the basis of Alain Berthoz's proposal on *simplicity* and its potential as a meta-theoretical perspective to decipher and to face complex processes (Berthoz, 2011a), such as the teaching-learning processes, are tools or *functional requirements* that facilitate "navigation" through complex scenarios by adopting simple rules or principles. In education, the concept of simplex properties allows the recognition and evaluation of the level of effectiveness of didactic prerequisites indispensable to plan the didactic action according to principles of effectiveness.

The *properties* are:

- *specialisation and modularity*, which is the capacity to lay out and use different resources in a given time in the constant and necessary macro and micro-regulations of the teaching-learning process. Modularity is

the capacity of systematizing teaching, in relation to the learning needs and the educational context, which necessarily involves prediction when teaching;

- *memory*, which can be understood as the capacity to capitalize previous experiences in the teaching-learning process, in a strategic and procedural way, harmonizing, re-using, modifying and evolving the results in action;
- *flexibility, vicariance and adaptation to change*, which is defined as the capacity to adopt a dynamic and flexible teaching approach that allows one to face complexity which is constantly diverse and is the result of the interacting network of relationships that connects places, objects, knowledge, teachers and students (Altet, 1999);
- *speed*, which is the capacity to interact with the learner by giving continuity to teaching through feedback. This is not the sum of two trajectories of action, but is a single route, constituting a complex system in which separating the two trajectories becomes impossible (Rossi, 2011). Speed is a teaching prerequisite that allows the teacher, in a conscious and subconscious form, to consistently and promptly put in action elegant solutions that are not necessarily simple, but are effective (Berthoz, 2011a);
- *reliability*, which refers to the capacity to create coherence between one's intentions in teaching and the actual act of teaching through the use of adequate and efficacious teaching aids. The simplex property of reliability in didactics, is a prerequisite to put together scope, flexibility, precision and timeliness, rights and duties, group and personal needs in the interaction taking place during teaching;
- *generalization*, which can be defined as the capacity to recapitalize some teaching methods that correspond to a systematized action and use them in similar situations or contexts. Generalization in teaching is never considered as a pattern or an automated style of teaching, but forms the basis on which to flexibly put into action a number of auto-regulations that are requested through the interaction with the individual subject, with the group and with the learning environment. Therefore in teaching, generalization is configured as a potential analogy on which to act.

Properties are hence configured as potential tools able to perform an antagonistic function to teaching linearity; their presence is a guarantee against both the risks of egocentrism in action as well as the inefficacy in reliable reading and interpretation of the learners' needs. In fact, being potentially able to *separate functions* and *act in a modular manner*, in other words within space and time, reduces the risk of routine teaching and limits the temptations to *economise* action, where one exclusively reproduces schemes that do not derive from the real requests of learners. These requests are entrusted to a heterocentric *memory*, which can be defined as the ability to rapidly capitalize

what happened at a previous moment in time and synthesize it with what is happening in the course of an action. From a simplex perspective, reliability is the antagonistic property to *reproductive patterns of action* and *blindness of interaction*, and envisages a *generalization* process that is efficacious and situated; a process that allows the understanding of the specificity of the context, the individual and inter-individual demands and constraints of the teaching-learning process, *adapting flexibly*.

### *Spaces*

Closely related to the dimension of time, space plays a central role in the history of European thought; one could think of Pythagoras and Parmenides up to contemporary physics. Over the centuries it has always been the subject of different epistemological orientations. The spatial arrangement in classrooms and schools, together with temporal organisation, have strongly influenced teaching: To be really educational, each environment needs to be arranged spatially (and temporally), analysing proxemic dynamics that regulate the teaching-learning process and communication within it (Gennari, 2006).

From a simplex perspective of teaching, *spaces*, can be considered as the set of *objects*, *spaces of interaction*, *tangible* and *intangible spaces* in which, with which and with reference to which teaching takes place.

In the *objects* of teaching, to be understood as the elements that contribute to the type, quality and quantity of teaching interaction (Sibilio, 2016), the following are expressed:

- the functionality of the characteristics and shape with respect to their use;
- the potential of these characteristics and shape with respect to additional uses other than their conventional purpose;
- the underlying symbolism of these characteristics and shape;
- the underlying symbolism referred to their use;
- the potential vicariance of use (Berthoz, 2015); in other words, the use of an object in a manner that is different from its conventional and original purpose or way of use. For example, gripping a pen in a different way than that modelled when writing;
- the potential functional vicariousness (Berthoz, 2015); that is, using an object to do something which is normally done using other specifically designed objects. For example: using a pen as a drumstick to create a rhythmic sound.

The *spaces of interaction* can be defined as those distances in the teaching interaction which are a synthesis between proxemics and communication (Hall, 1969; Argyle, 1992). It is therefore possible to categorise distances as follows:

- interpersonal distance, which can be personal and private, social and institutional, *reflecting* the gap between teacher and student interaction;
- the distance from the tools and resources used while teaching: board, screen, tech support, objects;
- character size and dimensions of images used in iconic and iconographic media, with reference to the needs arising from the distance between the learners and the screen, the board or the area being used;
- the distance and the position of the students in relation to the rhythm and to the movement of the teacher, from the point of view of the latter, hence from a *teacher-centric* perspective: proximal, distal, frontal, side, oblique position;
- the static and dynamic shape of the teacher's body during teaching in relation to the position and the learner's point of view; hence, in this case, from a *learner-centric* perspective;
- the diverse use of oral communication, with reference to the heterogeneous distance and position of students and in relation to the teacher's rhythm and displacements, in a *teacher-centric* perspective;
- the varied fruition of a teacher's oral communication who works in a static and dynamic manner while teaching, in relation to the learners' position and point of view, in a *learner-centric* perspective;
- different use of gestures and facial expressions when teaching such as:
  - egocentric representation of teaching: the use of the body independently from interaction;
  - allocentric representation of teaching: the ability to control the use of the body when teaching;
  - heterocentric representation of teaching: the use of gestures and facial expressions according to the interaction required. In this case, the body can be considered as a:
    - *symbolic space* capable of representing an alternative form of meaning;
    - *reproductive space* able to reproduce a shape or a mechanism that underlies or exemplifies a concept;
    - *metaphoric space* capable of dynamically interpreting the concept that underlies the meaning;
    - *intensifying space* in order to extend the meaning of the concept expressed in verbal, written, iconic or exploratory manner;
    - *extended space* where, through the extension of a gesture towards a learner, distances are reduced.

As regards tangible spaces, these can be divided into *intra-scholastic tangible spaces*, these are the physical spaces in schools that welcome the learning experiences and constitute the *outer perceptive shell* that teaching

disposes of: classrooms, laboratories, gyms, theatres, outdoor areas, yards. The *extra-scholastic tangible spaces* are museums, natural parks, monuments, squares etc.

As what concerns the *intangible spaces*, these constitute the boundaries of the function of teaching. With regards to the attribution of a cyclical model of praxis-theory-praxis in pedagogy (Fraunfelder, 1986, 1994; Frauenfelder and Santoianni, 1997, 2002; Frauenfelder et alii, 2004), the scientific community only recently considered a bottom-up approach as a suitable modality in the analysis of the teaching-learning process. Within this process, the biological and cultural dimensions of the individual coexist and they are substantiated and integrated by the tangible and the intangible aspects of the human experience.

In a reflection on the implications of neuroscience research in relation to teaching, the ethical dimension represents *the space of responsibility* to avoid:

- forms of reductionism related to the topic of *didactic neuromythologies* (Rivoltella, 2012) which translate research on the biological dimension of human beings, especially those related to cognitive neuroscience, in simplified educational applications;
- forms of gnoseological reductionism, which compress teaching in a narrow space of a disciplinary nature, do not meet the complexity of its ontological status and its dynamic epistemological dimension that is open to interdisciplinary and transdisciplinary contributions of scientific research, traditionally used in hard sciences.

The recognition, evaluation, selection, organization and manipulation of *tangible* and *intangible spaces* constitutes the prerequisite of teaching, natural expression of the interaction that precedes the teaching-learning process. When the teacher's action does not prove able to grasp the potential of interaction and the degree of freedom of the action within a given a space-time, limits the real meaning of space, its proteiform semantics, reducing in a *linear* manner the relations between teacher, student, objects, space and context.

In this regard, *linearity* constitutes an obstacle for the potential meanings of space, action, objects and places. In fact, the objects and spaces are routinely and linearly used for their traditional purpose; excluding any possible different reconfiguration that could represent an opportunity of *vicariant teaching* (Sibilio, 2016) both on the functional level and that of their use.

### *Functions*

The *functions*, in a simplex vision of teaching, result in co-action among:

- capacity to interact;
- diagnostic capacity;

- capacity to mediate;
- capacity of conscious and subconscious actions directed towards a purpose;
- capacity to adjust teaching according to general principles.

Each of these capacities does not carry out its functions autonomously, but requires the other skills to perform a task that is coherent to the action of teaching.

The capacity to interact is the dynamic function of teaching and is based on the relationship between teacher-student-environment. The interaction results in the ability to contribute, through action, to a co-action that promotes the individual's *potential of educability* (Frauenfelder, 1986).

Diagnostic capacities are the result of the conscious interaction and aid in attributing meaning to certain attitudes, behaviours and certain products which are the result of the learners' actions, in which teachers, through a heterocentric process, recognise specific needs and potential. At the same time, diagnostic capabilities are a mode of *teaching mirroring* which allows the teacher to recognize oneself through the interaction, whose *non-linear* nature produces a representation of his/her teaching. In this regard, the singularity of the learner gradually contributes to trace a profile of the teacher from a learner's perspective.

*Mediation capacities* (Damiano, 2007) refer to the process of harmonization between:

- a learner's manifested and implicit needs, according to a teacher's personal interpretation process;
- the needs of the educational context, its constraints and its resources;
- the teacher's competencies;
- the teacher's choices in relation to his/her culture and taking into account his/her personal epistemology;
- the objectives and the time available for teaching.

The *capacity of conscious and subconscious actions directed towards a purpose* constitute the coherent aspect in teaching, the teaching function that allows the continuous and diversified task to align action to purpose. On a conscious level, these capacities address the need to create a possible correspondence between intention and action in teaching; in this regard strong elements of complexity emerge that can impede such a correspondence. The main issues that arise in turning intentions in action in teaching are:

- the actual capacity to act by using simultaneously resources and methods, which are often different but are potentially complementary, in an effective way;
- a mode of interaction that is flexible and auto-regulated that faithfully reproduces the scope in teaching;
- the capacity to use all subconscious actions as teaching resources, regulated by that type of interaction that allows to know its nature and implications only during or after the teaching is taking or has taken place.

The *capacity to adjust teaching according to general principles* refers to the general principles outlined in the theory of simplicity applied to the field of didactics. These form part of a systemic and ecological perspective of the teaching-learning process (Bronfenbrenner, 2009); characterised by a bottom-up approach to educational research and is underpinned by bio-educational and neuro-educational concepts. Simplex principles, besides being a set of simple rules on which the function of the teacher is inspired, constitute an operational model and functionality in action during teaching that uses processes to overcome the complexity in education in an original, elegant and creative way (Berthoz, 2011a), notwithstanding the complexity of non-linearity and repeatability of the teaching phenomenon. The principles, applied to the field of didactics, are:

- *Inhibition and the principle of refusal* – this principle refers to a teacher’s capacity to regulate action while teaching with the aim of balancing the personal and professional dimension. With regards to the personal dimension, these principles allow the teacher to regulate efficaciously the emotional sphere in teaching, finding a balance between the learners’ real needs and the teaching context. Many attitudes and behaviours can in fact express an emotional imprint which derives from cognitive mechanisms that intervene in teaching and that do not always respond to the needs arising in the teaching-learning process. *Inhibition and the principle of refusal* are principles aimed at regulating the difficult equilibrium between the rational and the emotional domains of a teacher, with reference to any given need that varies depending on the learner’s characteristics and requests. Every time the teacher is faced with such a situation, one of the two domains prevails. At the same time, such a principle allows to control and reduce the risks of routine teaching, consciously deconstructing the natural didactic use of transpositive models that reassure the teacher and economise work while teaching.
- The *principle of probabilistic anticipation* – this principle constitutes a teacher’s capacity to carry out a diagnostic projection which results in predictions that guide action. Therefore, the teacher’s actions are the result of a predictive design that anticipates the end result of the teaching-learning process, providing a predictive meaning to certain elements.
- The *principle of specialisation and selection* – is action that draws on the plurality of the perceived potential of the resources and the cognitive styles aimed at a specific scope, thus assigning a multifaceted *meaning* and *modality* to interaction. The concept of *bubble of perception* (von Uexküll and Müller, 2004), inherent in the definition of Umwelt, restitutes the hologrammatic experience of the teaching experience, its perceptual boundaries and its potential, often unexplored, when using different mediators and tools.

- The *detour principle* – is the ability to act using a complementary complexity that in reality allows to simplify the teaching-learning process and to create an alternative route to routine patterns that favour the capitalization of resources and the learners' cognitive styles. The detour principle is underpinned by non-linearity in didactics; it triggers divergence, creative thinking and lateral thinking (de Bono, 1994, 2000) to provide an accessible dimension in particular for those who are not able to benefit from the tried and tested, widespread teaching methods but are often inaccessible. Therefore, detour requires a deconstruction of teachers' patterns and routines; even if these are proved widely effective, in no way can they be considered as one-fits-all solutions or generalizable within a vision of having a “*recipe book*” for teaching.
- The *principle of cooperation and redundancy* calls on the need for an integrated and selective use of different functions in teaching. The educational experience requires different teaching actions, which can coexist in different forms, having concurrent and conflicting functions with syntonic and diachronic modalities and/or with ego-centric and etero-centric approaches. In parallel to this, teaching uses a series of functions that coexist on conscious and subconscious levels, such as a gesture and verbal communication, and can be:
  - syntonic and non-conflicting: when the gesture syntonically confirms the words being pronounced during oral communication;
  - syntonic and conflicting: the gesture is syntonic to the word and is conflicting with the meaning of what is being communicated;
  - diachronic and non-conflicting: the gesture or the verbal communication diachronically confirm each other, whether it is the gesture that precedes the verbal communication or vice versa;
  - diachronic and conflicting: either the gesture or the verbal communication precedes the other, and whichever follows is in conflict with the meaning of the preceding action.

Naturally, both the gesture and the word are translated into meanings that depend on certain elements that go beyond the gesture and the linguistic label but are accompanied by conscious and subconscious interpretations that contribute to giving a *direction* to the process of meaning (Roth, 2001). Furthermore, teaching requires a process of redundancy, that is the perceptual selection that addresses the regulation of teaching during cooperation, situating some perceptual phenomena in such a way that they do not interfere on the quality of the didactic interaction.

- The *principle of meaning* requires teachers to constantly and continuously analyse and interpret the teaching-learning process. This is indispensable to

attribute meaning to a every single element in the didactic system that can be capitalised in the teaching experience. It is a continuous interpretative evaluation, elaboration and harmonisation of which to avail to teach and to favour the teaching-learning process.

Therefore, the *linearity* of functions in teaching highlights how *egocentrism* and *blindness in interaction* reduce the necessary activity and the consequent development of *diagnostic capabilities*, *the capacity to mediate*, and *the capacity of conscious and subconscious actions directed towards a purpose*. Within this perspective, an efficacious opportunity to limit *linearity in didactics* is represented by the adoption of simplex principles which, as previously outlined, are rules for adaptation to and reduction of complexity that put to use that non-linear didactic space, thus promoting a *capacity to regulate* teaching with reference to the general principles that aid in the emergence of all the functions to *potentiate* teaching.

### *Potentialities*

The potentialities in didactics represent the various types of resources that make up the available elements *as potential* to make teaching efficacious. These are:

- the *plurality of places* potentially accessible in the teaching experience that can be situated with respect to them (Rivoltella, 2013);
- the *plurality of tools* which refer to the use of objects and technologies as educational media, supporting a transdisciplinary vision of research on human-machine interaction, on the use and the transformation of objects, and on the ways to access knowledge in use in other fields of research;
- the *plurality and diversity of the subjects*, whose relation produces a rich interaction of educational opportunities in diverse forms:
  - inter-subjective;
  - group;
  - cooperative;
  - community;
  - tutorial;
  - assistance;
  - support;
  - horizontal;
  - vertical;
  - transversal;
  - circular;
  - of level;

- of gender;
- of age.
- The *plurality of the intellectual dimension and the cognitive styles of teachers and learners*: from this potentiality derives the ability to value and enhance relatively autonomous dimensions such as those referring to:
  - the type of cognitive operationalisation (Sternberg's triarchic theory of intelligence, 1998):
    - analytical intelligence;
    - creative intelligence;
    - practical intelligence;
  - the areas of application (Gardner, 1993):
    - verbal-linguistic intelligence;
    - bodily-kinesthetic intelligence;
    - logical-mathematical intelligence;
    - spatial-visual intelligence;
    - interpersonal intelligence;
    - intrapersonal intelligence;
    - existential intelligence;
    - naturalist intelligence;
    - musical intelligence;
  - the approaches:
    - convergent and linear;
    - divergent and not linear;
  - the attitudes potentially assumed in the presence of challenging situations (de Bono, 1985):
    - responsibility (blue hat);
    - rationality/linearity (white hat);
    - creativity and laterality (green hat);
    - emotion (red hat);
    - anticipation starting from negatives constraints (black hat);
    - anticipation starting from the positive elements that are available (yellow hat).

### **Didactic corporealities and posture: concluding reflections**

In this morphological perspective of didactics, *didactic corporealities* are those aspects of teaching that are manifested in bodily form, real and metaphoric representations of the triadic interaction between the teacher, the student and the environment. This is configured as the set of elements that contribute to a complex multidimensional meaning of the teaching experience,

able to contribute to a deconstruction of linear schemes of action that are repetitive in nature and are inadequate to address the emerging needs of 21<sup>st</sup> Century classrooms. In this regard, the *didactic corporealities* can represent a modality through which the teacher can express his/her own *didactic posture*, which can be defined as a representation of the set of elements that manifest the presence of:

- a *correct didactic transposition*, which highlights the correspondence between one's way of teaching and the harmonious and efficacious use of one's own resources to meet the emerging needs in the teaching-learning process, thus producing a *correct didactic posture*;
- *didactic paramorphisms*, which refer to the attitudes and behaviours that express difficulty in capitalizing resources and potentialities in teaching, which are modifiable and can be solved since they do not derive from consolidated and permanent elements;
- *didactic dysmorphisms*, or in other words, the consolidated difficulties in teaching that imply a permanent *curving* of action even when the teacher has become conscious of his/her actions.

The concept of *didactic posture* takes a holistic view of access and cognitive resources, without resorting to artificial and linear hierarchical organisations. It also acknowledges the possibility to hypothesise a specific analysis between teaching, motor control and postural attitudes that are derived. In fact, this *posture* can be considered as an *acted* representation that demonstrates both motor control abilities as well as the expressive and interactive characteristics of the subject. The representation each individual has of oneself and their capacity to interact harmoniously with the environment is "acted out" in posture. Therefore, the body schema is a representation of the level of organisation of motor control and the interaction with the environment, in a segmented and global form. Hence, an incorrect posture could be:

- either the result of an inadequate, partial, inaccurate, non-integrated representation of one's resources of interaction;
- or the result of structural problems that do not allow motor control to translate the representation into action;
- or the result of a motor control that is not able to translate into action a representation.

The elements that come into play to impede the correct structuring of the body schema and posture are the *characteristics* and the *functions* of the subjects, the *capacity to interact*, and the environment. In fact, this organisational process appears to consolidate itself, on average, within a specific time after which the schema remains in its entirety beyond the same presence of the parts of the body. This shows a level of representation which, once evolved, acts beyond the tangible dimension of the same parts of the body.

Similarly, the action taking place during teaching embodies a representation of the teacher who is acting, expressing *characteristics*, implementing *functions*, using *tangible and intangible spaces*, drawing on *potentialities* of various kinds: these are all *potential* elements available that can be used in the teaching-learning process.

Even in teaching, as in posture, a number of elements are projected, attributing a specific function to the personal epistemology of the subject. These are one's own representation of reality, one's biological and cultural dimension that interacts with subjects, objects and the environment.

In teaching, just like in the body schema, the action expresses the representation of the degree of organisation of the available resources to interact with the environment, through situated or extended teaching. As a result, a *didactic posture* is not correct when:

- it does not correspond to an adequate, precise and integrated representation of teaching from the interaction that solicits all the available resources;
- it is impossible, due to structural and/or functional difficulties, to apply in teaching one's conceptual representations;
- the teaching does not prove able to translate the intentions into an efficacious transposition.

Teaching conserves attitudes and behaviours that originate from situated and contextualized learning experiences, by consolidating certain routines, stereotypes and didactic automatisms that ignore the emerging needs in the course of the experience. In this regard, this persistence can be understood as a postural attitude of didactics which, in some cases, appears to act as if there were a presence of a "phantom limb" (Berthoz, 1997).

Morphologies, postures and didactic corporealities express the perceptual richness and the cognitive potential of teaching, facilitating a vision of an educational experience that makes knowledge tangible, and the relationship between body and mind, nature and culture become visible. Teaching involves deciphering and facing the complexity of the teaching-learning process in all and in each learner, favouring the use of instruments and principles that allow the possibility to vary the characteristics of action and the context, operate on the rhythm, style, properties, principles and spaces.

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